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ABSTRACT

This curriculum guide on foods and nutrition, covering one of the five content areas of the Energy and Family Curriculum Guide, has been designed to provide learning experiences and identify resources that can be used to develop units of study related to energy usage and conservation. The guide is intended for use in comprehensive courses of home economics as well as specialized courses of the home economics subject matter content areas, especially in the state of Texas. The guide contains four units covering energy lifestyles, energy management in food preparation, energy conservation practices in the use and care of food preparation appliances, and planning and preparing energy-efficient meals. For each major concept, the guide provides a competency statement, terminal performance objectives, as well as concepts and generalizations linked to specific learning experiences and resources. The guide contains three appendixes. Appendix A contains a bibliography of books, pamphlets, multimedia materials, and other teaching aids. Appendix B consists of prepared information sheets, games, bulletin board ideas, check sheets, evaluation forms, and transparency masters. Appendix C is a collection of background information that may be helpful to the teacher in using the learning experiences. A glossary completes the curriculum guide. (KC)

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ENERGY AND THE FAMILY CURRICULUM

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ACKNOWLEDGEMENTS

FOREWORD

The level of energy literacy must be raised in our nation. The citizens of the future need to be more knowledgeable about energy and begin now to make wise decisions for the future use of energy. Home Economics Education programs are designed to teach decision making, value clarification, and identification of resources being used by individuals and families in the homes of our nation.

There are things we can do to help citizens of the future to be more knowledgeable about energy and begin to make wise decisions about use of energy. The Energy and the Family Curriculum Guide has been designed to provide learning experiences and identify resources that can be used to develop units of study related to energy usage and conservation. The guide has been prepared for use in comprehensive courses of Home Economics I and Home Economics, II, as well as specialized courses of the Home Economics subject matter content areas. Materials included in the guide are organized into five content areas of Home Economics:

1. Consumer Education
2. Foods and Nutrition
3. Home Management
4. Housing and Home Furnishings
5. Textiles and Clothing

Competency statements and terminal performance objectives were developed for the broad conceptual areas of study. Generalization statements related to key concepts were written opposite appropriate learning experiences. The domains and levels of learning were considered in developing learning experiences. Suggested resources were referred to and can be found in appendices at the end of each content area section. Appendix A contains a bibliography of books, pamphlets, multimedia materials and other teaching materials. Appendix B has prepared information sheets, games, bulletin board ideas, check sheets, evaluation forms and transparency masters. Appendix C is a collection of background information that may be helpful to the teacher in using the learning experiences.

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SCOPE AND SEQUENCE CHART OF CONCEPTS RELATED TO
ENERGY AND THE FAMILY

HOUSING AND HOME FURNISHINGS

A. Selection of Energy-Efficient Housing
    1. Human needs and values
    2. Mobile homes
    3. Apartments
    4. Townhouses
    5. Single-family dwellings
    6. New types of energy-efficient housing
        a. Solar
        b. Earth
        c. Homes for the future

B. Evaluating a Home for Energy Efficiency
    1. Heat transfer
    2. Air infiltration
    3. Building an energy-efficient home
        a. shape and surface area
        b. house orientation
        c. glass area
        d. landscaping
        e. choice of heating and cooling alternatives
        f. kitchen planning
    4. Retrofitting Existing Homes
        a. Ways to retrofit existing homes
            1. caulking
            2. weatherstripping
            3. foam gaskets
            4. water heating conservation measures
            5. insulation
            6. shading devices
            7. storm or double-paned windows
            8. attic ventilation
        b. Home energy audit

C. Maintaining Thermal Comfort through Interior Design
    1. Design elements inside and outside the home
        a. color
        b. texture
        c. shape and form
    2. Window treatments
    3. Furniture arrangement
    4. Lighting
        a. bulbs
        b. fixtures

FOODS AND NUTRITION

(Home Economics I)

A. Energy Lifestyles

B. Energy Management in Food Preparation
   1. Use and care of food preparation appliances and equipment
   2. Using cookware and bakeware
   3. Food cleanup techniques
      a. Hot water usage
      b. Handwashing vs. automatic dishwashing
      c. Disposal of waste

(Home Economics II)

A. Energy Conservation Practices in Use and Care of Food Preparation Appliances
   1. Conservation awareness
   2. Conventional ovens and surface units
   3. Microwave appliances
   4. Small appliances

B. Planning and Preparing Energy-Efficient Meals
   1. Meal Planning
   2. Oven meals, one-dish meals
   3. Preparation during emergencies
   4. Economics of food production and storage

TEXTILES AND CLOTHING

(Home Economics I)

A. Role of Clothing in Energy Management/Thermal Comfort
   1. Effect of design elements on thermal comfort
      a. Color
      b. Texture
      c. Style
      d. Shape
      e. Accessories

B. Energy Management in Clothing Construction
   1. Management of energy in equipment use
   2. Construction projects
      a. Draft dodgers
      b. Warm sack

C. Personal Care and Energy Use
   1. Consumption of energy by grooming appliances
   2. Energy management habits

(Home Economics II)

A. Role of Clothing in Energy Management/Thermal Comfort
   1. Fabric selection
      a. Fiber content
      b. How fiber is spun
      c. Properties in relation to thermal comfort
   2. Relationship of fabric care to energy use
   3. Clothing Selection for Thermal Comfort
      a. Clo value
      b. Activities
      c. Climate
      d. Accessories
   4. Special Clothing Requirements
      a. Childre
      b. Elderly
   5. Recycling Clothing
   6. Classic Fashions vs. Fads

CONSUMER EDUCATION

A. Value of Energy
   1. Uses
   2. Sources

B. Budgeting Energy Use
   1. Lifestyle needs
   2. Cost of operating appliances
   3. Reading the meter
   4. Budgeting plan
   5. Interpreting the utility bill
   6. Customer services available for budgeting and financial assistance
   7. Selection and use of energy-efficient equipment
   8. Energy for transportation

HOME MANAGEMENT

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B. Energy Usage of Appliances
   1. Determining wattage
   2. Calculating operating cost

C. Energy Conservation in Home Activities
   1. General conservation practices
   2. Major appliances
   3. Menu planing
   4. Household cleaning appliances
   5. Personal care

D. Managing Transportation

E. Managing Leisure Time

F. Managing Existing Resources

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FOODS & NUTRITION

MAJOR CONCEPT: Energy Lifestyles

SUGGESTED FOR: Foods and Nutrition-Home Economics I

COMPETENCY STATEMENT: Assess lifestyle habits in relation to use of energy for food preparation.

TERMINAL PERFORMANCE OBJECTIVES: The student will be able to:

Recognize lifestyle habits that affect energy consumption in food preparation.

Analyze changes in family lifestyle that may result from a need to modify use of electricity.

Analyze use of energy for food preparation in different life cycle periods.

CONCEPTS AND GENERALIZATIONS	LEARNING EXPERIENCES AND RESCURCES
Food Habits and Energy Consumption	
Personal values will dictate actions.	*Complete survey, "Electricity For Fun, Convenience, Work." See Appendix B, pages 20-22. Tabulate electricity attitude rating of students. Lead members to decide which jobs in the home could be done without electricity. Have the students check all those items in exercise 1 that grandparents or older neighbors enjoyed 40 years ago. Lead students to note whether these uses of electricity are considered easy to do without or are essential today.
The cost and availability of energy will directly affect food for the family.	Brainstorm in groups to identify various forms of energy used to provide food for the family. *Use "Lifestyle Evaluation Worksheet" to interview relatives, neighbors, and own family to identify lifestyle characteristics that affect food preparation, such as: dual-career family, varying work schedules, habits, number of appliances, etc. See Appendix B, page 23. Make a list of household appliances/equipment used to prepare food in the home. Using the list, students will rate the importance of each appliance on a scale of 1 to 10. Have students check the appliances they could do without.

Organize class for a debate to resolve the question of whether or not a particular electrical appliance is a necessity in food preparation.

Role play how food preparation activities would be affected if electricity were rationed.

Suggest that students select an electric kitchen appliance that they use and have them give it up for one week. At the end of the week report back to the class difficulties encountered and what alternatives they used.

*Analyze cartoon of kitchen with an abundance of electrical appliances. A caption comes from television, "the President announces - all households must cut back on energy expenditures." A couple thinks, "How could we possibly help?" See Appendix B, pages 24-25.

Family Life Cycle Periods

Our concern is not only each individual's role in the family but also the family's relationship to society.

Voluntary simplicity is not limited to a single life cycle period or lifestyle but rather is applicable to people in all periods of life.

Energy usage for food preparation varies from one life cycle period to another.

Display bulletin board "A Bright New Beginning." See Appendix B, page 26.

*Describe life cycle needs that affect food preparation. Invite a senior citizen to tell the class about life without the appliances and conveniences that we have today. Ask them to describe food preparation without electricity, identifying fuel source. What conveniences in food preparation today represent the biggest changes from the first half of this century?

*Have students make a list of all appliances families at different life cycle periods would use. Discuss how they differ from one life cycle period to another.

Changing Lifestyles

Natural resources are limited and shrinking rapidly in supply; it is these factors that will affect living standards all over the world and will change the habits of consumption of Americans of all ages.

Describe in a paragraph what life styles for the 21st century might be like and how this will effect meal planning, food preparation and the use of energy in both areas.

*Involve students in developing a bulletin board, "Kitchen of The Year 2000."

MAJOR CONCEPT: Energy Management in Food Preparation

SUGGESTED FOR: Foods and Nutrition-Home Economics I

COMPETENCY STATEMENT: Utilize energy-efficient methods of preparing, storing, and serving foods.

TERMINAL PERFORMANCE OBJECTIVES: The student will be able to:

Demonstrate ability to conserve energy when preparing and storing food.

Analyze habits of using appliances in the kitchen.

CONCEPTS AND GENERALIZATIONS	LEARNING EXPERIENCES AND RESOURCES
Energy Efficiency in Food Preparation	
Different methods of food preparation consume different amounts of energy. Similarly, different appliances are rated at different wattages and consume varying amounts of energy.	Have students make a list of food preparation appliances used in the kitchen. Have students calculate the operating cost of appliances used during the preparation of a meal, using worksheet, "Calculating Cost of Appliances." See Home Management section of this guide, Appendix B, page 30, and 38-39. Discuss "Energy Efficient Food Preparation," identifying wise use and care of appliances and equipment. See Home Management section of this guide, Appendix B, pages 36-38, and 43 and Appendix B, this section, page 27.
Energy consumption by food preparation appliances can be reduced by using and caring for appliances correctly	*As a review, have an "Appliance Conservation Bee." Select 2 team leaders who choose Call out the name of an appliance. Taking turns, team member will stand and state an energy saving tip for use of the appliance, or sit down. The team with the most members standing wins the "Bee." Complete a time/motion study during a lab experience. A mystery student could count the number of times the students open and close the refrigerator and freezer doors. At the end of the lab, the mystery student will reveal the number and recognize the most energy-efficient person. Construct a bulletin board on "Use and Care of Appliances". See Appendix B, page 28.

List items of foods that could be considered economical in use of energy for meal preparation. Plan energy-efficient menus using foods listed. Prepare one menu in lab and evaluate.

Plan a bake day using the idea that all baking can be done in one day. Have students bake and store several items.

Selecting and Using Cookware and Bakeware

Proper selection of cookware and bakeware can result in energy savings.

1. Glass & ceramic utensils allow temperature to be reduced 25°-50° because they retain heat.
2. Pots should have flat bottom, straight sides, & tight lids.
3. Pots should cover heating element & not extend more than 1" over edge.
4. Tea kettles avoid heat loss through steam when boiling water.

Show filmstrip on "Cookware and Bakeware" by Mirro Corporation. See Appendix A.

*Discuss proper selection of cookware for energy savings.

Invite a representative from a local department store specializing in bakeware and cookware. The person could discuss selection and use of products available to the consumer.

Plan a demonstration using several designs of cookware and bakeware, and compare cost of efficiently designed cookware. Tasting party can follow.

Divide students into small groups. Distribute copies of several menus, and ask students to indicate the types of cookware that could be used, giving reasons for choices.

*Demonstrate the effect of using lids on pans. See Appendix B, pages 29-30.

Food Cleanup Techniques Using Hot Water

Heating water accounts for approximately 20% of all the energy used in the home, and some of this energy can be saved by wise use of hot water in the kitchen.

*Discuss tips for dishwashing. See "Family Energy Saving Tips for the Home" listed in Appendix B, Home Management Section, pages 57-58.

Keep a record of how many times the home dishwasher is used in one day and for one week. Also record the size of loads, cycles used, and methods of drying. As a class, calculate the energy used. Note: If a student has no dishwasher at home, a hand dish-

washing record may be kept, noting method used for rinsing, number of times washed and rinsed in a day, etc.

*Debate which cleaning technique requires more energy - hand dishwashing or using the dishwasher. Discuss energy conservation practices of both techniques.

Discuss methods of obtaining hot water, such as the hot water dispenser. Divide into groups to research various products for giving the consumer hot water. Evaluate which one is more energy efficient.

Brainstorm for other energy-saving cleanup tips, including the food waste disposal, that can be used in the lab and at home.

Small group of students role play cleanup situations. Class should take notes of incorrect procedures.

Construct a mobile of cleanup hints to display in the foods lab.

Construct bulletin board, "Save Energy In Kitchen Cleanup." See Appendix B, page 31.

Disposal of Food Wastes

A major source of energy waste is in packaging of food.

Discuss the abundance of disposable or throwaway items available to the consumer. See Appendix B, page 32.

*Compare the amount of energy consumed by packaging materials, such as beverage containers in kilowatt hours. See Appendix B, page 33, "What's for Lunch?" Point out that the soft drink bottle and the mason jar took the most energy. Use transparency, Appendix B, page 34 to review KWH used. Decide whether items are renewable, reusable, biodegradable or recyclable.

Discuss advantages and disadvantages and possible alternatives for the use of the items.

Create a compost pile for use as fertilizer from organic waste from foods lab. Suggest to students that making a compost pile could be a home experience.

Disposals

Compactors require little electrical energy and conserve energy required for waste handling.

*Discuss the issue of a trash compactor. Are they really necessary? List the advantages and disadvantages.

MAJOR CONCEPT: Energy-Saving Practices in Use and Care of Food Preparation Appliances

SUGGESTED FOR: Foods and Nutrition-Home Economics II

COMPETENCY STATEMENT: Assess energy conservation practices in use and care of appliances.

TERMINAL PERFORMANCE OBJECTIVES: The student will be able to:

Employ methods of using appliances that are energy efficient.

Formulate plans for preparing foods that will conserve energy.

Evaluate decisions for buying and storing foods in terms of being energy efficient.

Choose appliances and equipment that will be energy efficient when preparing foods.

CONCEPTS AND GENERALIZATIONS	LEARNING EXPERIENCES AND RESOURCES
Conservation Awareness	
Appliances and equipment account for 33 percent of the energy consumed in the home.	*Write these words on the board in this order scrambling the individual words.

nptsmucnoio	CONSUMPTION
voen lmeas	OVEN MEALS
rtoiuntn	NUTRITION
msall ailapnpcse	SMALL APPLIANCES
citfefnei	EFFICIENT
eclycre	RECYCLE
eavlu	VALUE
aelvitatner	ALTERNATIVE
rteim	TIMER
eicnnteedrndepe	INTERDEPENDENCE
noorigtaanzi	ORGANIZATION
lnaatru screecsrou	NATURAL RESOURCES

Have students unscramble the words. Then ask them what word is formed by using the first letter of each unscrambled word. Discuss how each word might affect conservation of energy in the kitchen. Have class members develop a definition of the word "conservation" in relation to food preparation. Write definition on the board.

Construct a bulletin board "Energy Conservation Is Now." See Appendix B, page 36.

Discuss cost of using various appliances in the kitchen. See Home Management section

of this guide, Appendix B, pages 30 and 38-44.

Conventional Ovens and Surface Units

The key to efficiency in operating kitchen appliances is the way in which they are used.

*Demonstrate use and care of range surface units and oven. Contact local utility Company for demonstration materials.

Every time the oven door is opened during operation, the oven temperature drops 25 to 30 degrees, resulting in more use of energy.

Assign ranges in the lab to groups of students. Distribute copies of "use and care" instructions for each range to the students. Ask students to identify procedures for operating the range in an efficient manner.

Review "Energy-Efficient Food Preparation." See Home Management section of this guide, Appendix B, pages 54-56 and Appendix B, page 41 of this section.

Microwave Ovens

Microwave ovens are efficient becaue they produce no heat and they cook in approximately ¼ the time using ½ the wattage of a conventional electric oven.

View Microwave Cooking filmstrips ABC's For Microwave Cooking and Micro-Cooking. See Appendix A.

Using information from use and care manual for microwave appliances, explain principles of microwave cookery as compared to conventional cooking. Consult references from major appliance companies or local utility company. See Appendix A.

Discuss question: What would have been the effect on energy consumption if more than one food was cooked in the oven at once? Would this method of conserving energy be more effective for conventional or microwave ovens?

Demonstrate preparation of food in microwave appliance.

*Compare the energy used to prepare foods with the microwave oven versus the conventional oven. See Appendix B, page 37.

Display bulletin board, "The Wave of the Future is Now." See Appendix B, page 38.

Students complete Microwaving Magic crossword puzzle. See Appendix B, pages 39-40.

Small Appliances

Small appliances, when used in place of the conventional oven can save a significant amount of energy.	Compare wattage of small appliances used in food preparation to the conventional oven and the surface units. See Home Manage- Section page 15, "Wattages of Common Appli- ances".
	Prepare snacks or one-dish meals with the toaster oven or electric skillet. See "Energy Saving Recipes," Appendix B, page 42.
Small appliances as compared to the surface units of a con- ventional range use relatively the same amount of energy and time.	Teacher demonstrates use of several different small appliances. Have students prepare reports on wattage used, ways in which the appliance could save energy, and suggest menus that could be prepared using small appliances. Consult the "Use and Care Booklets." See Appendix B, pages 43-44.
	Prepare baked potatoes, meat loaf or bacon using the oven, electric skillet and the microwave oven. Compare cost and time required to cook the foods. ~~See Appendix B, page 45~~.
	Students are given one week's dinner menus. Adjust menus to use appliances which are more energy efficient.

MAJOR CONCEPT: Planning and Preparing Energy-Efficient Meals - Meal Planning

SUGGESTED FOR: Foods and Nutrition-Home Economics II

COMPETENCY STATEMENT: Apply energy conservation principles when planning and preparing meals.

TERMINAL PERFORMANCE OBJECTIVES: The student will be able to:

Prepare food in an energy-efficient manner.

Develop nutritious menus that use energy efficiently.

Recognize energy-efficient characteristics of materials used in constructing utensils.

Compare food production methods in relation to energy used.

CONCEPTS AND GENERALIZATIONS	LEARNING EXPERIENCES AND RESOURCES
Meal Planning	
Energy-efficient meals can be nutritious and appetizing if thoughtful planning occurs.	View films: "Principles of Meal Planning," "Meal Planning in Action," "Meal Planning for Future." See Appendix A.
	*Have students identify ways to prepare food that will conserve energy. Ask students to list several foods in each group of the basic four and identify a possible method for preparing that would use energy wisely.
	Using food models, have students display examples of energy-efficient menus. Ask them to give reasons for their choices.
	Ask students to develop a file of recipes for foods that could be prepared in an energy-efficient manner.
	*Plan menus that would be energy efficient. Choose one for preparation in lab.
Oven Meals	
An oven meal is one in which everything for the meal is cooked in the oven at the same time. Oven meals save energy in the conventional oven.	*Distribute information sheets on oven meals. Appendix B, pages 46-49. Evaluate menus in terms of suitability for oven meals. (Note: same temperature used for baking, length of cooking time, and use of only one appliance may be discussed).

*Develop plans for preparing a nutritious, energy-efficeint oven meal. Calculate amount of wattage used for 30-minute and 60-minute oven meals.

One-Dish Meals

One-dish meals save energy because the main dish and vegetable are cooked in the same container and appliance.

*Have students plan and prepare nutritious one-dish meals. Possible one-dish meals might include: pizza, creative quiche cookery, and casseroles.

Have students assemble a clip-and-copy file of nutritious, easy to prepare one-dish meals.

Food Preparation During Emergencies

Blackouts are an interruption of all electrical power in a given area caused by storm damage, equipment failure, or overloaded cicuits because of unusually heavy consumer use.

Brownouts are the deliberate reduction of power to users of electrical utilities whenever demand for power exceeds generating capacity.

Blackouts & brownouts affect normal food preparation.

*Discuss what blackouts and brownouts are and what causes them. Discuss environmental factors that occur in our area that result in the loss of power. Have students discuss with their families what action they can take to prevent blackouts and brownouts.

*Have students brainstorm about what procedures they would follow if a blackout occurred for several hours and for one day. The students should consider what items could be refrozen, cooked immediately or discarded. Teacher can refer to Forecast, March 1978, page 49, "Cooking with Dividends." Students can use Co-ed, March, 1978, page 68, "Fast-to-Fix Meals".

Conduct a laboratory for an emergency meal.

*Plan and prepare a meal using no energy sources.

Have students plan and carry out a picnic with objectives to: 1). spend little money 2). spend as much time outdoors as possible, and 3). contribute as little pollution as possible. Based on these objectives select mode of travel, cooking fuel, foods, food spoilage, how to package food for trip, campsite setup, and picnic setup.

Have students plan meals that require supplemental forms of energy. Then have students prepare the meals. Example: sun tea; solar

oven; salads, barbecue. See Appendix B, pages 50-52.

Food Production

By the time food reaches the consumer's plate, the total energy expended is many times that contained in the food being eaten.

It is the processing, transportation and distribution of the food that absorb most of the energy.

Develop a bulletin board, "Food Production Process." See Appendix B, page 53.

Plan a field trip to a food processing plant. Note the energy used in production, preparation, storage, etc. Discuss uses of energy in production of foods.

Have students select foods on McReddy's Energy Menu according to personal preference. Then have students rank the foods in each category according to energy consumption of production. Discuss energy menu and the energy consumption of each item.

Have students do activity titled "How Much Energy Does Peanut Butter Use?" and discuss the questions following activity. See Appendix B, pages 56-74.

Have students compare energy expenditures in various methods of food preservation and storage using lab experiences.

*Discuss steps in food production using transparencies to trace the steps. See Appendix B, pages 75-76. What steps can be saved by eating fresh vegetables?

Have students construct the steps for producing several different food items, such as pizza, cake, hamburger, T.V. dinners, etc. Compare amount of energy used in obtaining the item of food away from home with amount of energy expended if prepared at home.

*Ask students to visit supermarket to compare price of foods in different forms: i.e., canned, frozen, fresh, dried. Explain the difference in price in terms of energy expended in production.

Ask students to list every food, including snacks, drinks, etc., consumed in one day. Have them list energy steps used in producing several of the foods. What other nutritious foods might they have eaten that used less energy in production?

Using transparency, "Food-Related Energy Consumption," discuss: 1). energy resources that are renewable and non-renewable; 2). food preparation habits that use energy; 3). home production vs. retail buying. See Appendix B, page 77.

Food Storage

If food is not properly wrapped and stored, spoilage will occur.

*Distribute handouts to students on "Food Storage Equipment." See Appendix B, pages 78-79.

Collect a variety of food storage wrapping materials. Discuss selection of proper wrap for items that will be placed in the freezer and for items to be refrigerated. Demonstrate correct wrapping procedures.

Distribute "Basic Rules for Success in Freezing." See Appendix B, page 80. Discuss food storage tips and how long food will remain fresh and safe in the refrigerator and freezer.

The way food is stored affects the amount of energy used and the time spend in food preparation.

*Ask students to be responsible for cleaning and organizing either the refrigerator or the freezer at home. Have students write a paragraph describing changes they have made and stating why the changes were made.

Ask students to prepare an inventory sheet of foods in the freezer at home. Reorganize freezer to make it more energy efficient, drawing a diagram showing the placement of differenct food items. Involve students in sharing what they learned from the experience.

Arrange for a symposium of homemakers in different life cycle periods to discuss ideas about food storage and methods they have used.

Have students pick food model from grocery grab bag and explain how to store the food correctly. Identify correct packaging methods and the proper storage area.

Preparation of food in quantity saves time and energy.

*Have students make a list of materials which would make storage of food more convenient and energy efficient. Demonstrate use of various containers. See Appendix A.

Have students pick food model from grocery grab bag and explain how to store the food correctly. Identify correct packaging methods and the proper storage area.

Preparation of food in quantity saves time and energy.

*Have students make a list of materials which would make storage of food more convenient and energy efficient. Demonstrate use of various containers. See Appendix A.

APPENDIX A

FOODS & NUTRITION

BIBLIOGRAPHY

Appendix A - Bibliography
Foods and Nutrition

Books

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Meal Management, filmstrip, Butterick Publishing Co., P. O. Box Box 1945, Altoona, PA 16603.

Meal Planning in Action, filmstrip, Butterick Publishing Co., P. O. Box 1945, Altoona, PA 16603.

Meal Planning for the Future, filmstrip, Butterick Publishing Co., P. O. Box 1945, Altoona, PA 16603.

Pamphlets

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"Cooking," from the Energy & Money, Are Your Wasting or Saving series, Gulf States Utilities.

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"Reddy's Consumer Tips on Ranges & Ovens," Gulf States Utilities.

"Reddy's Consumer Tips on Refrigerators and Freezers," Gulf States Utilities.

"Refrigeration" from the Energy & Money, Are Your Wasting or Saving series, Gulf States Utilities.

"Water Conservation," Maytag Technical Bulletin #10, Home Economics Department, The Maytag Company, Newton, Iowa 50208.

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Teaching Materials

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APPENDIX B

TEACHING MATERIALS

FOODS AND NUTRITION

HOME ECONOMICS I

Electricity for Fun, Convenience, Work

Please answer the following survey as honestly as you can. There are no right or wrong answers.

1. Check the column which best describes your attitude toward doing without the following electrical items. Even though some of these items may also be powered by natural gas or gasoline, assume an ALL ELECTRIC environment.

Item	Easily	With Some Difficulty	With Great Difficulty	Would Not Give This Up
radio				
stereo				
television				
air conditioning				
dishwasher				
clothes washer				
iron				
microwave oven				
stove				
refrigerator				
freezer				
lights				
electric mixer				
electric razor				
space heater				
toaster				
elevators				
hair dryer				
dehumidifier				
fans				
vacuum cleaner				

electric games

blender

electric blanket

typewriter

calculator

dentist's drill

telephone

clothes dryer

hot water heater

garbage disposal

power tools

electric golf cart

2. Just for fun, rate yourself by counting up the number of checks in the last three columns ____(all but "easily").

   If there are ten checks or less, you could tolerate a rather Spartan independence of most electrical appliances. If you count 15 checks or less in the last three columns, you use of modern appliances is moderate. If you have 16 or more checks in those areas, you are quite dependent on electricity for your lifestyle. On the number line below, plot your dependency on electricity.

   What is Your Electricity Attitude Rating?

10 checks	11-15 checks	16 checks
Spartan	Moderate	Dependent

   1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

3. Which of the following jobs could you do adequately in your house without electricity? (Circle them.)

   1. cooking
   2. washing clothes
   3. drying clothes
   4. washing dishes
   5. drying hair
   6. storing food in summer
   7. storing food in winter
   8. lighting_
   9. keeping warm in winter
   10. keeping cool in summer

4. In order to guarantee the continuation of those services which you find difficult or impossible to do without (see 2), it may be necessary for you to accept some of the following conditions. Let #1 represent the most tolerable cost of power usage and let #7 represent the least acceptable one. In which order would you accept:

   ____having no more than two children
   ____living within ten miles of a nuclear power plant
   ____possibility of food contamination
   ____occasional interruption of power
   ____increased cost of electricity
   ____severe air pollution
   ____shorter life span

LIFESTYLE EVALUATION WORKSHEET

1. How many members are in your family?

2. How many of your family members work outside the home?

3. How many meals are usually prepared in your home each day?

4. How many times do you eat alone at home?

5. How many times do you eat together as a family?

6. How many times do you and your family eat out in one week?

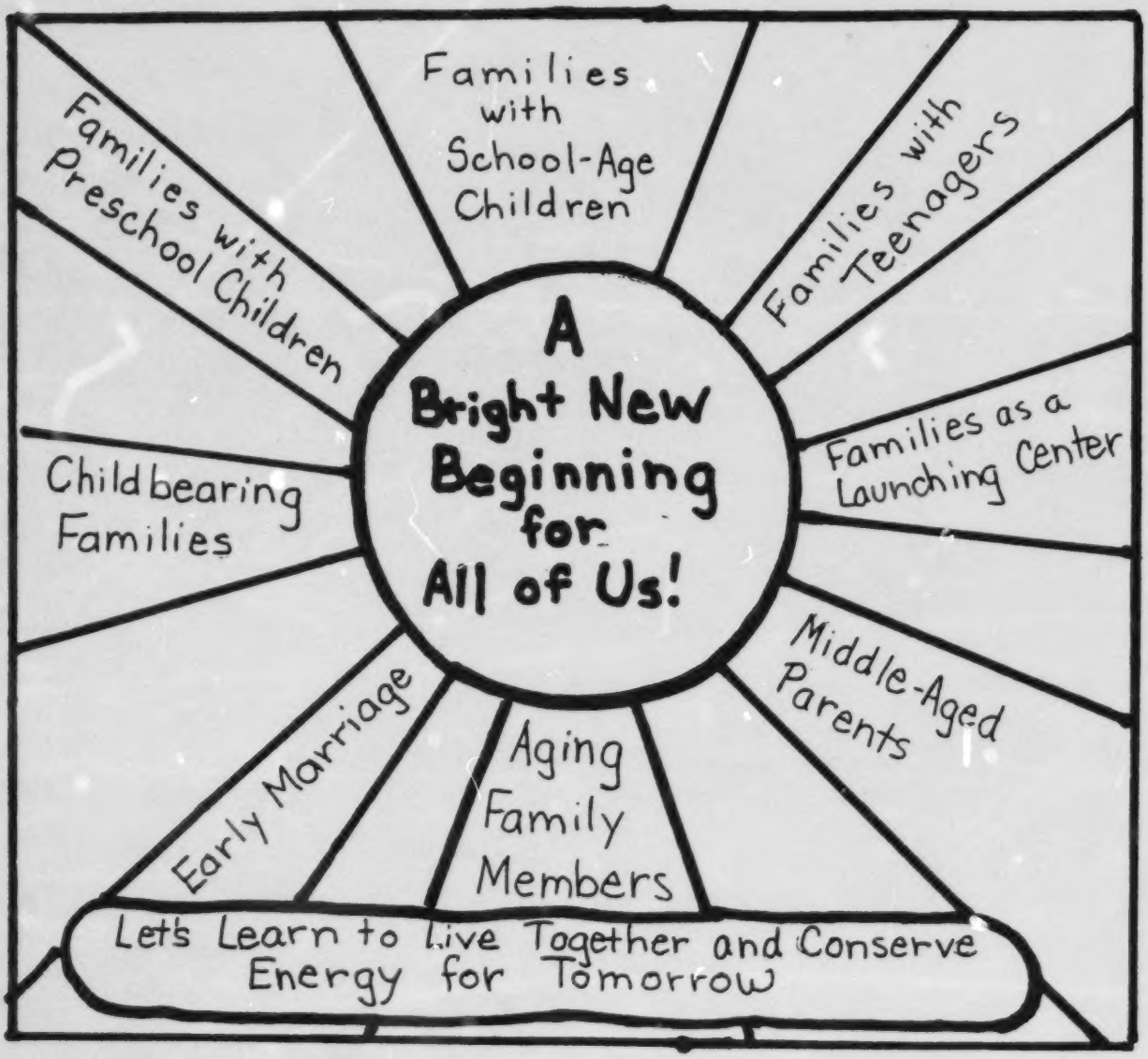
7. What is your mode of transportation when you go out to eat?

8. When fixing dinner at home, do you: prepare from a recipe or use convenience foods (most often)?

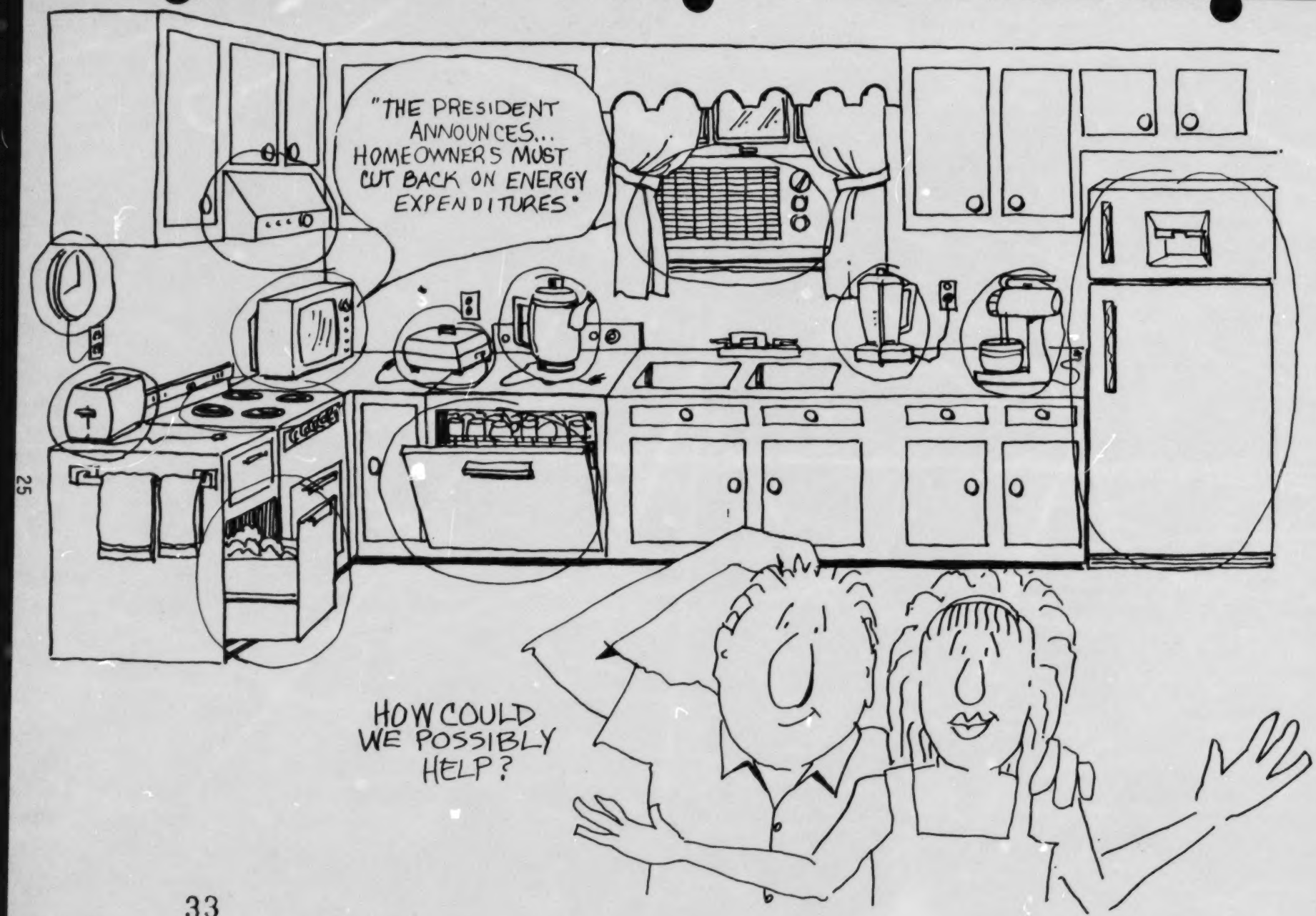
9. How many appliances do you have in your kitchen?

10. When preparing meals, how many appliances do you usually use?

11. After a meal is served, how many different appliances or household equipment items are used?


Families with Preschool Children
Families with School-Age Children
Families with Teenagers
Childbearing Families
A Bright New Beginning for All of Us!
Families as a Launching Center
Early Marriage
Aging Family Members
Middle-Aged Parents
Let's Learn to Live Together and Conserve Energy for Tomorrow

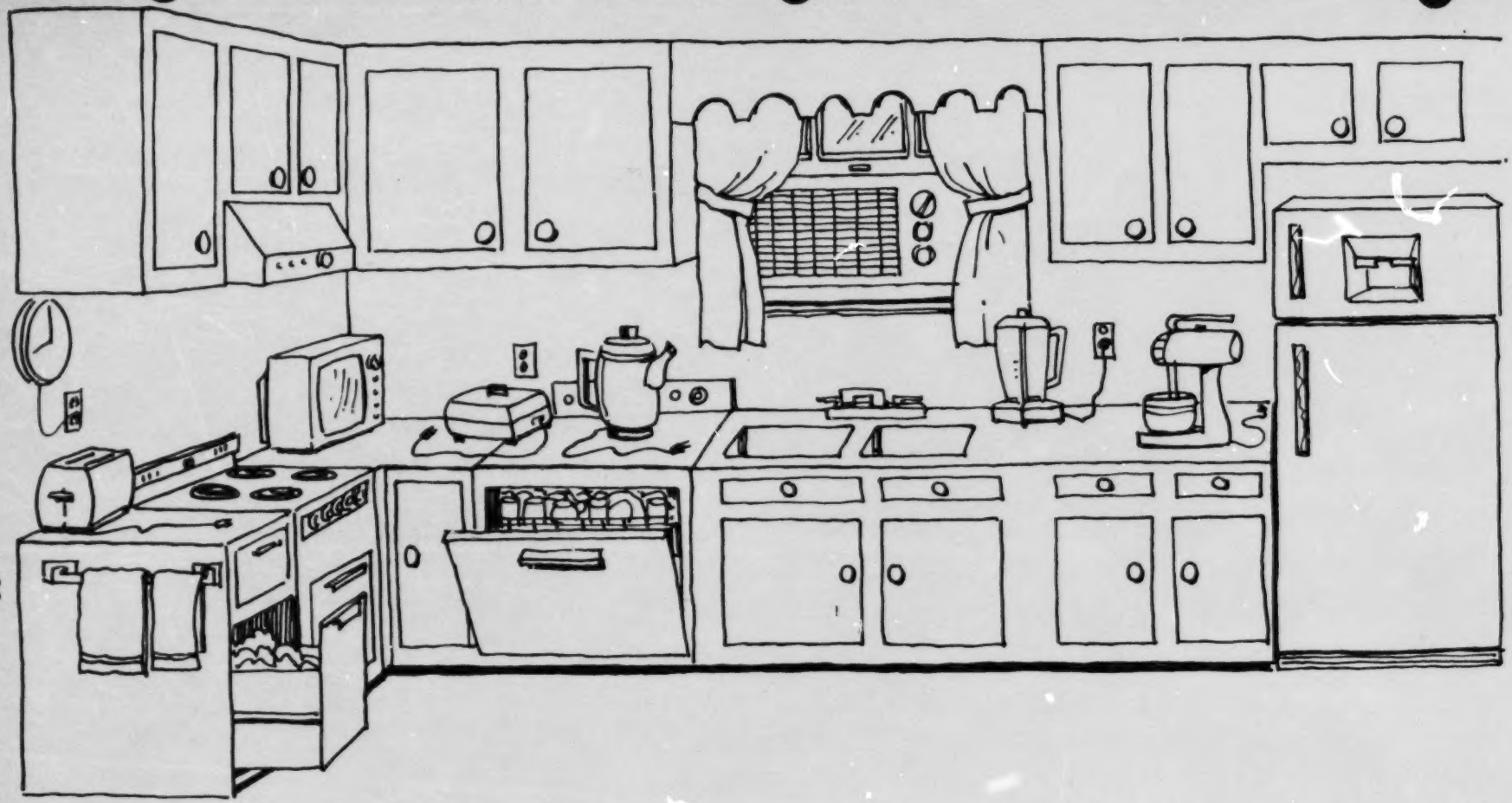
(Insert pictures of family life styles in blank sections.)


"THE PRESIDENT ANNOUNCES... HOMEOWNERS MUST CUT BACK ON ENERGY EXPENDITURES"
HOW COULD WE POSSIBLY HELP?

25

33

34



26

35

36

MAINTENANCE OF APPLIANCES

Proper maintenance of cooking appliances is also important, not only to conserve energy but also for safety. Clean appliances work more efficiently, more safely, and certainly more hygienically. Proper inspection of equipment will help insure efficient operation. The following steps should be taken to maintain the efficiency of cooking appliances:

Keep heat reflection surfaces clean, especially the oven and the reflectors below the heating element on top of the range.

For the most efficient use of fuel, gas burners should have a steady blue flame. A yellow flame means an adjustment or cleaning is needed.

Make sure the pilot on a gas range is properly adjusted. It may be using more fuel than necessary.

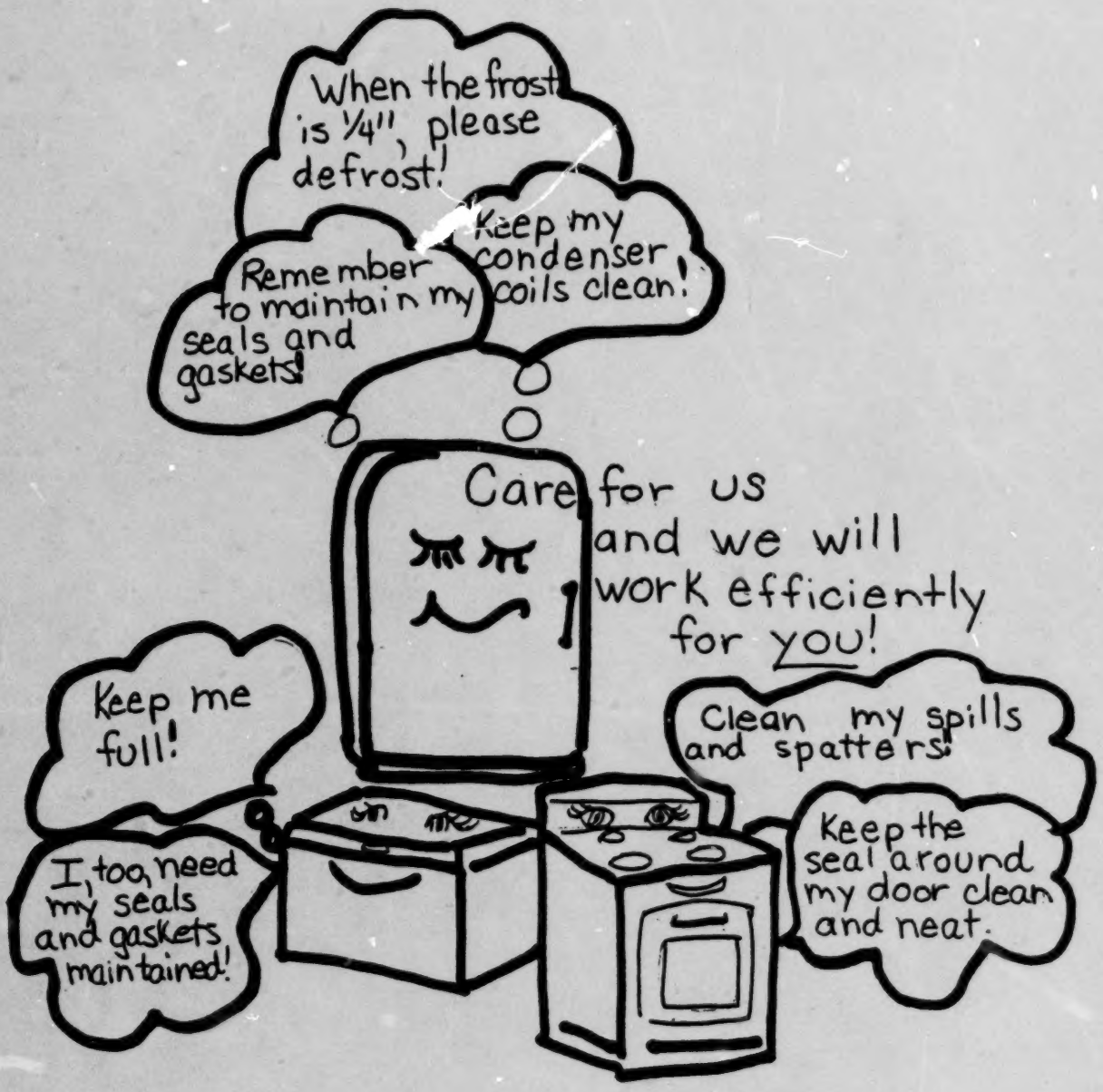
Have faulty switches, burners and thermostats fixed promptly and professionally. Check the oven thermostat every six months with a thermometer.

Make sure oven door seals are tight and not leaking heated air.

Air filters on exhaust fans must be cleaned periodically to work effectively and efficiently.

Take advantage of the heat-sensing elements on gas and electric ranges to control the surface unit. It allows the unit to cut off the energy supply and "coast" occasionally while still cooking. Electric surface units can be shut off a short period (5 minutes or so) before the food is done. The food will continue to cook from the stored energy.

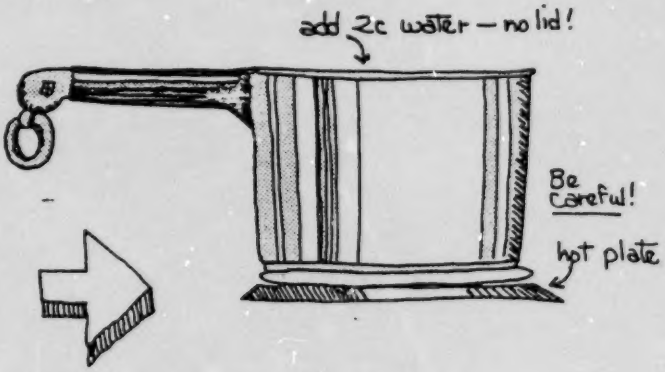
Remember to turn off all units immediately after use. A warning light or buzzer is helpful as a reminder. Establish the habit of turning off the range before removing utensil.


When the frost is 1/4", please defrost!
Keep my condenser coils clean!
Remember to maintain my seals and gaskets!
Care for us and we will work efficiently for YOU!
Keep me full!
Clean my spills and spatters!
I, too, need my seals and gaskets maintained!
Keep the seal around my door clean and neat.

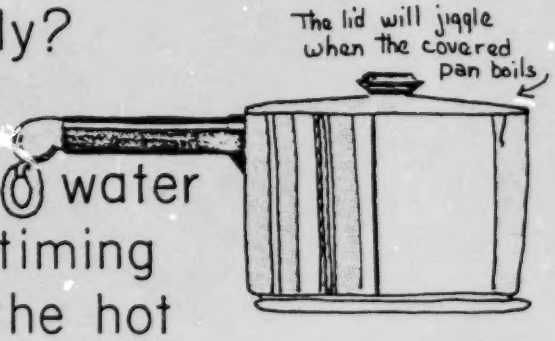
HOW MUCH ENERGY CAN BE SAVED BY BOILING WATER IN A COVERED PAN ?

MATERIALS:
- Hot plate
- Pan with lid
- Watch
- Water
- Styrofoam cups

Heat up the hot plate.
Then, do this:



Start timing when you place the pan on the hot plate. How long does it take for the water to boil vigorously?

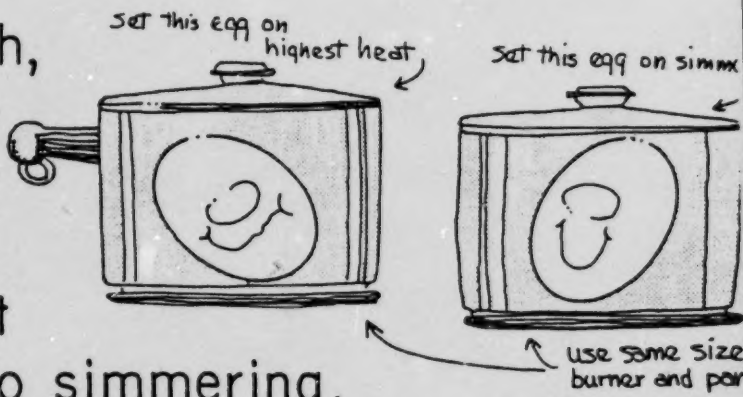


Empty the pan and let it cool. Add 2 more cups of water and cover the pan. Begin timing again when you put it on the hot plate. How long does it take for it to boil? Did covering the pan save energy?

OTHER IDEAS TO EXPLORE:

Bring 2 pans of water to a boil.

Place an egg in each, and put each one on the same size burner on a stove. Set one burner to the highest heat and the other to simmering.



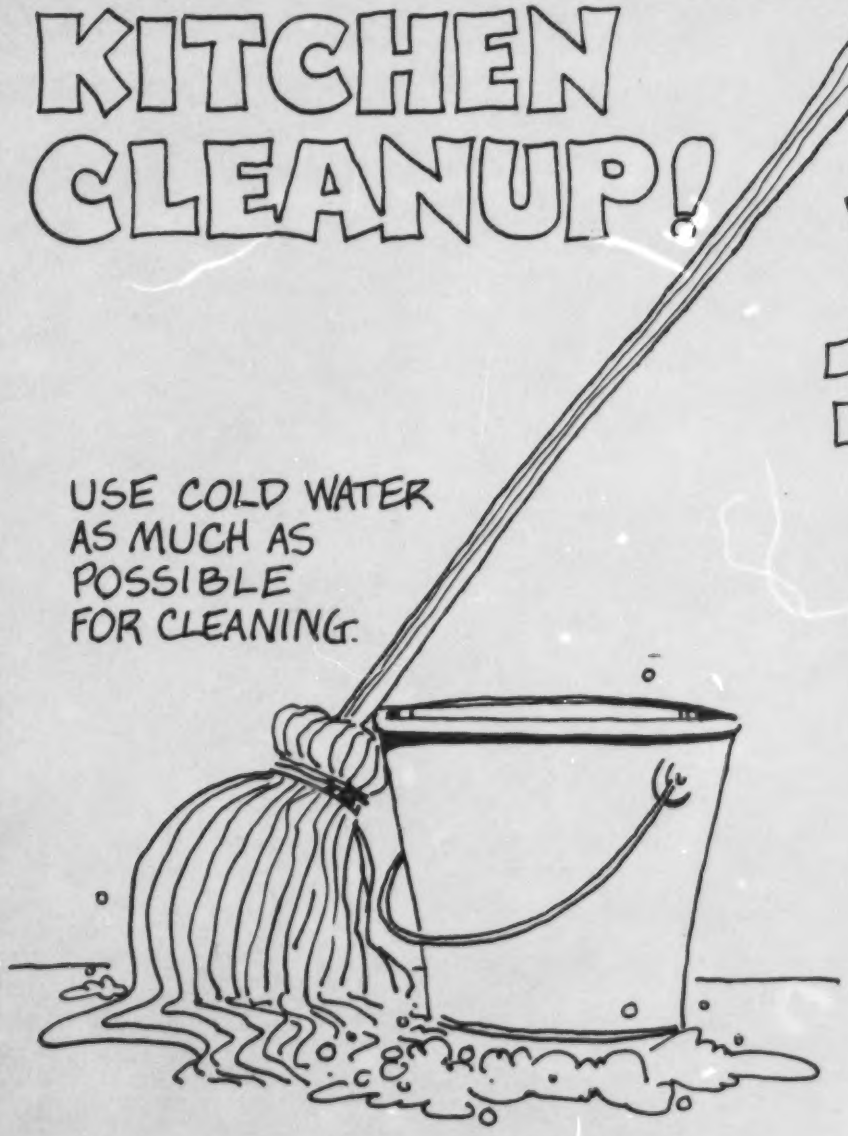
Time them for 3 minutes, then pour the water out of both at the same time.

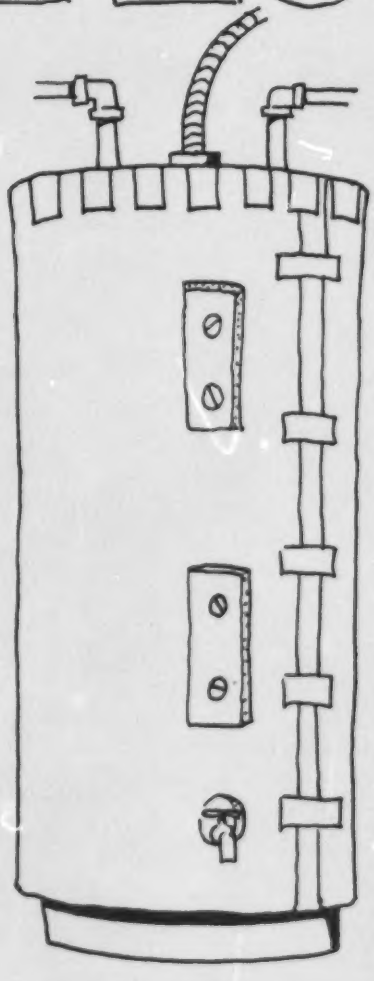
Is one egg more cooked than the other?

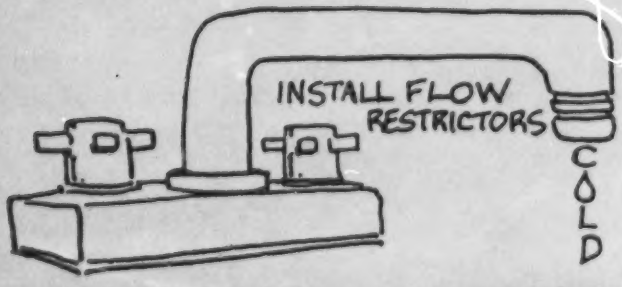
SAVE ENERGY IN KITCHEN CLEANUP!

120°-140°

USE COLD WATER AS MUCH AS POSSIBLE FOR CLEANING.







DON'T LET THE WATER RUN WHILE WASHING DISHES BY HAND.

RINSE DISHES IN COLD WATER BEFORE LOADING THE DISHWASHER.

INDIRECT USE OF ENERGY IN FOOD PRODUCTION

Few people realize the extent of the indirect use of energy to produce food - energy consumed in the manufacture of food-related equipment; manufacture and transportation of fertilizer, pesticides, and herbicides; manufacture, maintenance, and operation of farm equipment. The higher up the food chain, the more energy is consumed by the product. For example, beef cattle are more energy-intensive than vegetables, and man is more energy-intensive than cattle. In an energy-conserving society, a conscious effort would be made to shift from animals raised on feed lots to animals raised on the range, form animal protein to vegetable protein, from meat, fish, poultry, eggs, milk and cheese to soy products, wheat germ, dry beans, peas and lentils.

The more direct energy costs of preserving, packaging and transporting food are the most obvious. Drying food to preserve it can require little energy, particularly if done by solar energy. Canning uses more energy than drying. Freezing requires even more energy, and energy must be continuously used during storage. To conserve energy, reduce the use of extensively processed foods. Of course, fresh foods eliminate the energy and cost of preservation.

A major source of energy waste is in packaging: Often more energy is embodied in the container than the food itself. One way to reduce this inefficiency is to cut down on disposable containers. Another is to purchase food in bulk. The most energy-intensive foods items are in throw-away aluminum cans, plastic bottles, ready-to-heat frozen packages, and aerosol cans. The packaging makes a great deal of difference; for example, twice as much energy is required to produce a 6-ounce aerosol spray can of cooking oil as an equal amount of bottled cooking oil. The re-use of containers could yield a drastic energy savings. The Environmental Protection Agency estimates that if 90 percent of the market used returnable beverage containers, the equivalent to 92,000 barrels of oil per day would be saved.

The greatest single inefficiency in the food system is in transportation of food from the market to the home. The use of a two-ton vehicle - the family car - to transport 30 pounds of food several miles once a week is grossly inefficient. To conserve energy, shopping trips should be carefully planned. It is helpful to write menus for a few days or a week and then make a shopping list. Consult newspapers, radio and television for bargains. Since freeway driving is nearly twice as economical as driving in heavy city traffic, shopping trips should be carefully combined with commuting trips. Better yet, bike or walk to a store in your immediate area.

WHAT'S FOR LUNCH — THE SOUP OR THE CAN?

Definitions: Kilowatt (KW) . . . . . One thousand watts
Kilowatt hour (KWH) . . . . One thousand watts on for one hour
Food calorie . . . . . 0.0011627 KWH; 860 calories = 1 KWH

Comparison of Kilowatt Hours Contained in Food vs. Package

Returnable pop bottle (8 oz.)	KWH
Pop (Coca Cola), (8 oz., 98 calories)	KWH
Milk carton (8 oz.)	KWH
Milk (8 oz., 160 calories)	KWH
Steel can (8 oz.)	KWH
Tomato juice (8 oz., 45 calories	KWH
Paper cup (8 oz.)	KWH
Coffee (8 oz., 1 calorie)	KWH

Energy Cost of Beverage Containers

Container	KWH for Production	Renewable	Reusable	Biodegradable	Recyclable
Returnable pop bottle (8 oz.)					
Non returnable pop bottle (8 oz.)					
Milk carton (8 oz.)					
Steel can (8 oz.)					
Aluminum can (8 oz.)					
Polyvinylchloride bottle (8 oz.)					
Glass package (8 oz.)					
Paper cup (8 oz.)					
Styrofoam cup (8 oz.)					
Mason jar (8 oz.)					

SOURCE: **Energy Management Strategies for Home Economics Teachers, Public Service of Colorado**

WHAT'S FOR LUNCH — THE SOUP OR THE CAN?

Definitions:
Kilowatt (KW) . . . . . One thousand watts
Kilowatt hour (KWH) . . . . One thousand watts on for one hour
Food calorie . . . . . 0.0011627 KWH; 860 calories = 1 KWH

Comparison of Kilowatt Hours Contained in Food vs. Package

Returnable pop bottle (8 oz.)	1.42	KWH
Pop (Coca Cola), (8 oz., 98 calories)	.10	KWH
Milk carton (8 oz.)	.24	KWH
Milk (8 oz., 160 calories)	.19	KWH
Steel can (8 oz.)	.58	KWH
Tomato juice (8 oz., 45 calories	.05	KWH
Paper cup (8 oz.)	.84	KWH
Coffee (8 oz., 1 calorie)	.001	KWH

Energy Cost of Beverage Containers

Container	KWH for Production	Renewable	Reusable	Biodegradable	Recyclable
Returnable pop bottle (8 oz.)	1.42		X		X
Non returnable pop bottle (8 oz.)	.85				X
Milk carton (8 oz.)	.24	X		X	
Steel can (8 oz.)	.58			X	X
Aluminum can (8 oz.)	.16				X
Polyvinylchloride bottle (8 oz.)	.80				
Glass package (8 oz.)	.58				
Paper cup (8 oz.)	.84	X		X	X
Styrofoam cup (8 oz.)	.25				
Mason jar (8 oz.)	1.42		X		X

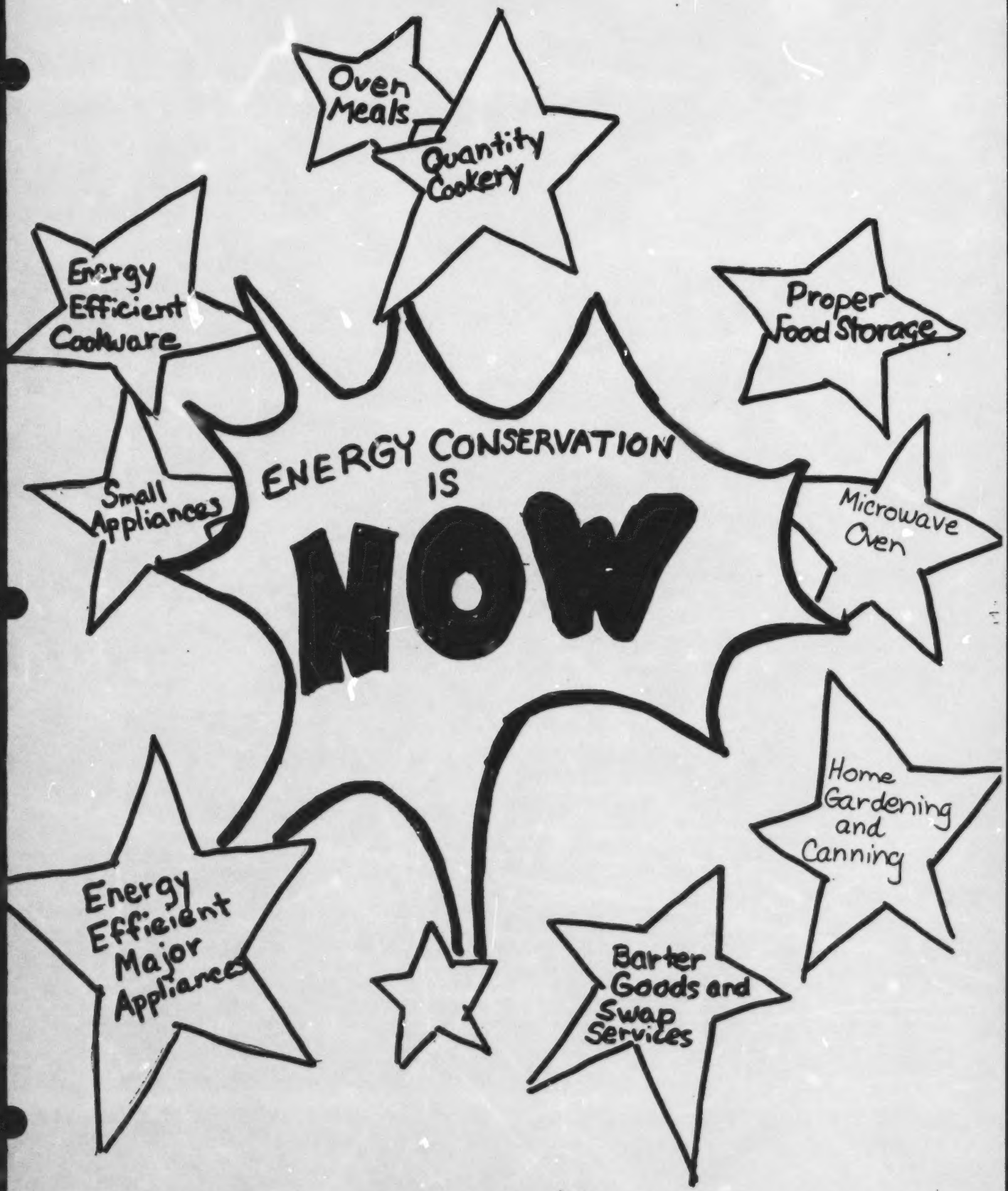
SOURCE: **Energy Management Strategies for Home Economics Teachers, Public Service of Colorado**

APPENDIX B

TEACHING MATERIALS

FOODS AND NUTRITION

HOME ECONOMICS II


Oven Meals
Quantity Cookery
Energy Efficient Cookware
Proper Food Storage
ENERGY CONSERVATION IS
NOW
Small Appliances
Microwave Oven
Home Gardening and Canning
Energy Effieient Major Appliances
Barter Goods and Swap Services

48

COMPARISON OF MICROWAVE AND CONVENTIONAL COOKING

CAKE (Use the same recipe in each oven)

Conventional Oven:

_____ watts x _____ minutes x $\frac{1}{60,000}$ = _____kilowatt-hour.

Microwave Oven:

_____ watts x _____ minutes x $\frac{1}{60,000}$ = _____kilowatt-hour.

TUNA CASSEROLE

Conventional Oven:

_____ watts x _____ minutes x $\frac{1}{60,000}$ = _____kilowatt-hour.

Microwave Oven:

_____ watts x _____ minutes x $\frac{1}{60,000}$ = _____kilowatt-hour.

FROZEN TV DINNER

Conventional Oven:

_____ watts x _____ minutes x $\frac{1}{60,000}$ = _____kilowatt-hour.

Microwave Oven:

_____ watts x _____ minutes x $\frac{1}{60,000}$ = _____kilowatt-hour.

FOUR BAKED POTATOES

Conventional Oven:

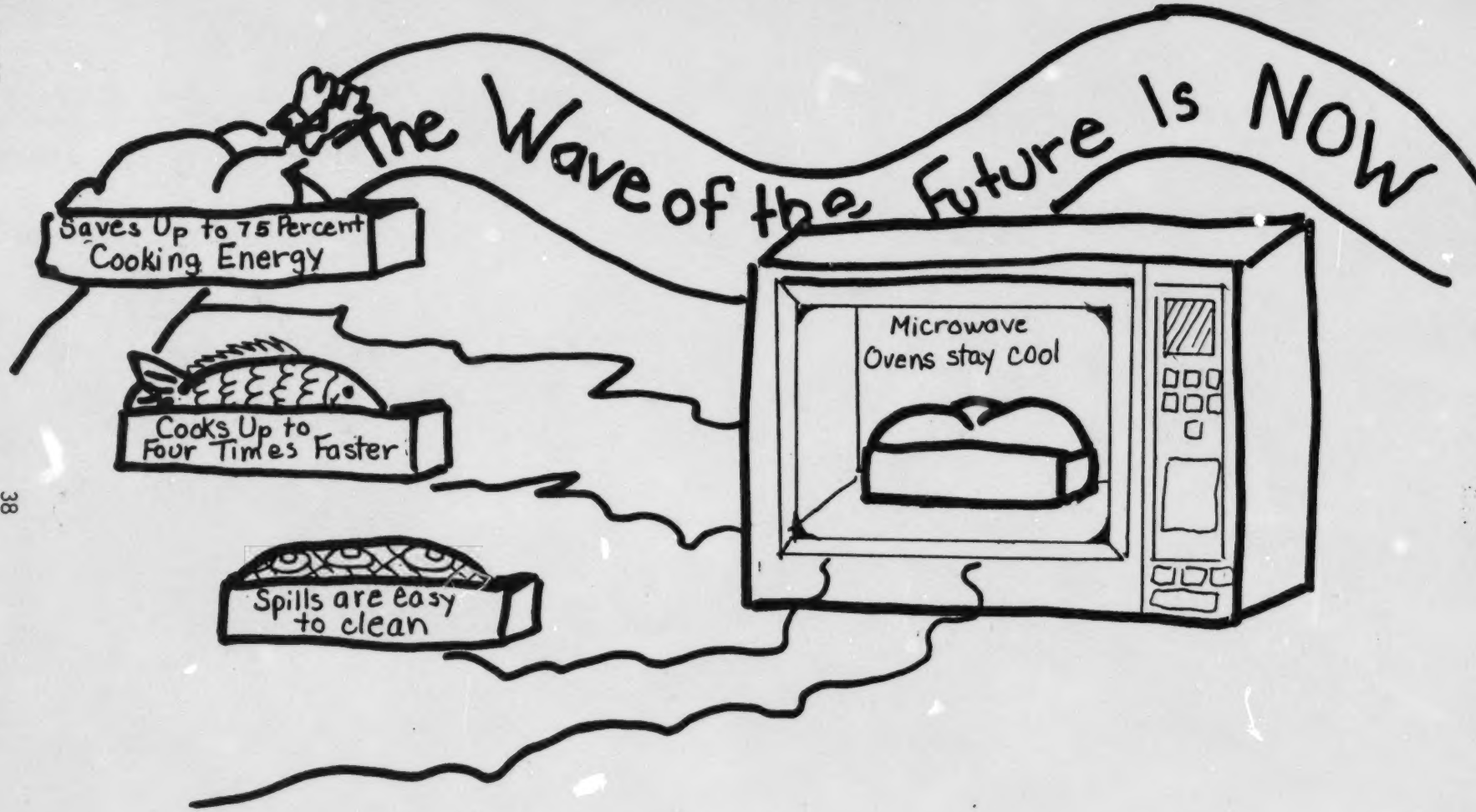
_____ watts x _____ minutes x $\frac{1}{60,000}$ = _____kilowatt-hour.

Microwave Oven:

_____ watts x _____ minutes x $\frac{1}{60,000}$ = _____kilowatt-hour.

Tabluate Your Results

Food item	Energy Used by Conventional Oven	Energy Used by Microwave Oven
CAKE	____kilowatt-hour	____kilowatt-hour
TUNA CASSEROLE	____kilowatt-hour	____kilowatt-hour
TV DINNER	____kilowatt-hour	____kilowatt-hour
BAKED POTATOES	____kilowatt-hour	____kilowatt-hour

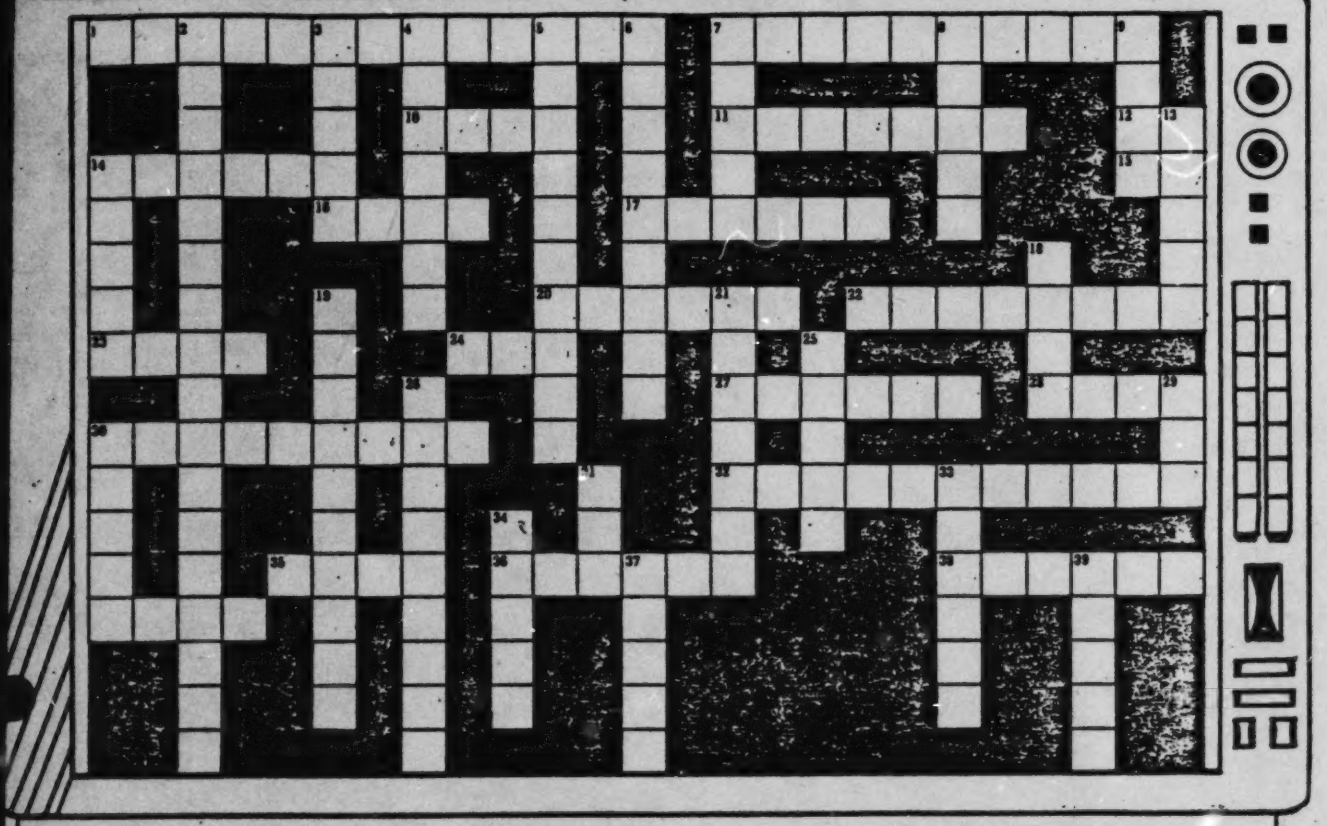

The Wave of the Future Is NOW
Saves Up to 75 Percent Cooking Energy
Cooks Up to Four Times Faster
Spills are easy to clean
Microwave Ovens stay cool

38

50

51

MICROWAVING MAGIC



ACROSS

1. An energy-saving, fast-cooking appliance. (2 words).
7. A combination microwave/ _____ oven cooks with hot air and microwaves.
10. Place potatoes in a circular pattern, or _____.
11. Room in the home where microwave oven is kept.
12. Two-letter word for location.
14. _____ money, energy, and time are three attributes of the microwave oven.
15. Two-letter word for destination.
16. A progressive measure toward a result.
17. The microwave cooking _____ is a fast way of preparing foods.
20. Practice _____ self-confidence.
22. 2 cups and ½ tablespoon are examples of these.
23. To mix.
24. One should learn to use _____ features on a microwave oven, not just one.
27. When baking a cake, it is necessary to _____ the pan with butter, margarine, or shortening.
28. Many recipes developed for the microwave oven can be found in _____ papers.
30. Conventional recipes can be _____, or changed, for use in the microwave oven.
32. 350°F is a common _____ for baking.
35. _____ until the basic steps are mastered before attempting a more difficult task.
36. Always read the use-and-care _____.
38. Temperature _____ signal when the food reaches a pre-progammed degree.

DOWN

2. _____ are used for browning and broiling (2 words).
3. Poultry drumsticks and _____ should be shielded with foil to prevent over-cooking.
4. An assortment of foods.
5. _____ retain their nutrients when microwaved because less water is needed.
6. Microwave ovens are becoming a _____ with today's fast-paced lifestyles.
7. Popular desserts for birthdays.
8. Use warm, sudsy water to _____ the microwave oven.
9. The cooking area should be kept _____ and organized.
13. Various ovens have different _____ or sounds when the cooking time is up.
14. A browning dish _____ or browns meats.
18. Steam from food can cause a _____.
19. Foods are cooked by these.
21. Top-of-the-line microwave ovens have _____ read-outs which display cooking time and time of day.
25. Any flaws or buckles in the _____ or rims of the microwave oven should be repaired quickly.
26. Program mistakes can be erased and _____, or put in again.
29. To perceive with the eyes.
30. A lid.
31. Microwaving can be enjoyable and _____.
33. To fix.
34. An aroma.
37. Most microwave ovens sold are countertop _____.
39. To _____ foods, they must be placed under the broiling unit in a conventional oven.

Microwaving Magic - Key

Across	Down
1. Microwave oven	2. Conventional Ovens
7. Convection	3. Wings
10. Ring	4. Variety
11. At	5. Vegetables
14. Saving	6. Necessity
15. To	7. Cakes
16. Step	8. Clean
17. System	9. Neat
20. Builds	13. Tones
22. Measures	14. Sears
23. Stir	18. Burn
24. All	19. Microwaves
27. Grease	21. Digital
28. News	25. Seams
30. Converted	26. Reentered
32. Temperature	29. See
35. Wait	30. Cover
36. Manual	31. Fun
38. Probes	33. Repair
	34. Smell
	37. Units
	39. Broils

SOURCE: Forecast, December 1980, pp. 30, 32.

COOKING WITH CONSERVATION

MATERIALS:

18 slices of bacon (6 for each appliance)
electric range
electric skillet
microwave oven
frying pan
paper towels
paper plates
long forks
timer or clock with second hand

PROCEDURE:

1. Place 6 slices of bacon in the frying pan and place on range top burner. Put 6 slices in the electric skillet. Place 6 slices on a paper plate and cover with 2 napkins and put in microwave.

2. Cook the bacon with each appliance, while timing to determine cooking time.

3. When bacon is done, remove from appliance and drain.

4. Record times on the attached sheet and do calculations to determine which method used less energy.

Wattage:		Time to Cook 6 slices of bacon (in hours)
Electric Range		
6-inch element	1600 watts	_____
8-inch element	2100 watts	_____
Electric Skillet	1500 watts	_____
Microwave Oven	1500 watts	_____

Electric Range

$\frac{\text{\_\_\_\_ watts}}{\text{1000 watts}}$ X _____ time in hrs. = ____ kilowatt-hours (kwh)

____kwh X ____cents per kwh = ____ cost

Electric Skillet

$\frac{\text{\_\_\_\_ watts}}{\text{1000 watts}}$ X _____ time in hrs. = ____ kilowatt-hours (kwh)

____kwh X ____cents per kwh = ____ cost

Microwave

$\frac{\text{\_\_\_\_ watts}}{\text{1000 watts}}$ X _____ time in hrs. = ____ kilowatt-hours (kwh)

____kwh X ____cents per kwh = ____ cost

ENERGY-SAVING RECIPES

HAMBURGER SKILLET DINNER

3/4 cup uncooked rice
2 Tbsps. fat, melted
½ cup chopped onion
½ cup chopped celery
½ cup minced green pepper
1 lb. ground beef or veal
1 no. 2 can tomatoes
2 tsp. salt
¼ tsp. pepper
1 tsp. sugar
1 cup meat stock or 1 bouillon cube dissolved in 1 cup hot water
1 tsp. Worchestershire sauce
chopped parsley

Brown rice slowly in hot fat in skillet, stirring frequently. Add onions, celery, green pepper and ground meat. Brown well. Add tomatoes, salt, sugar, pepper, stock and Worchestershire sauce; cover and cook on low heat until rice is tender (about 45 minutes). Sprinkle with parsley. Makes 4 servings.

SKILLET CAKE

Use a butterscotch, chocolate fudge, or spice cake mix. Prepare mix as directed on package. Preheat 11-inch electric skillet to 250 degrees. When hot, grease slightly with unsalted fat. Add cake batter and bake at 250 degrees 30-40 minutes, leaving vent open. Remove from skillet. Cool and top with whipped cream or ice cream or some delicious sauce.

SKILLET COOKIES

1 lb. pkg. dates, pitted
½ cup butter or margarine
1 egg, well beaten
1 cup sugar
1 cup chopped pecans
1 tsp. vanilla
2 cups Rice Crispies
flaked coconut

Combine dates, butter, egg and sugar in skillet and cook until dates dissolve, stirring constantly. Add pecans, vanilla and Rice Crispies. Cool slightly, roll into balls and roll in coconut.

"MIX-EASY" CHOCOLATE-CHOCOLATE CAKE (MICROWAVE)

½ of one 18.5 oz. box fudge cake mix (about 2 cups dry mix)
1 egg
½ tsp. vanilla
1/3 cup cooking oil
3/4 cup water
One 6 oz. pkg. semi-sweet chocolate pieces

Place dry cake mix in ungreased 12 x 8 x 2 inch dish. Add remaining ingredients in order listed and stir in dish until smooth and creamy. Sprinkle chocolate pieces over top. Place in microwave oven. Cook on High 7 to 9 minutes (no turns necessary). Serve warm or cool with ice cream or thawed frozen whipped topping.

ENERGY COSTS IN THE KITCHEN

Which uses less energy: broiling hamburgers in an electric-range broiler or in a toaster oven? If you're cooking stew, does a slow cooker "spend" more energy than a pressure cooker? The following data was collected from research by the Good Housekeeping Institute. Of course, the energy you use when you cook depends on more than the type of appliances. It's affected, too, by the kind and amount of food you're cooking, so it's not easy to make broad generalizations. But a few are possible. For instance, for the foods we cooked the electric self-cleaning oven "well insulated for high-temperature cleaning" saved an average of 25 percent over the non-self-cleaning oven. The gas-convection oven (in a full-size range) saved an average of 40 percent fuel over a conventional oven. Electric skillets are great energy savers when used as an oven (for cakes, etc.-see chart) though they use almost as much energy as a range-top unit when used as a skillet. You save time but not always energy with a pressure cooker, but save both time and energy with a microwave oven.

The amounts of energy your appliances use may differ slightly from the amounts used-see below for brands and models. Following package and/or manufacturer's directions, the same kinds and amounts of foods were cooked in each appliance. In some cases different cookware was used-the Dutch oven, for example, didn't fit into the toaster oven, so a foil-covered loaf pan was substituted. Glass ovenware was used in the microwave oven. Unless noted below, all cooking results were comparable.

BAKED POTATOES: Four medium-sized baking potatoes (Russet Burbanks) were scrubbed, pricked and baked; those in the electric skillet and slow cooker were foil wrapped (manufacturer's directions). The microwave oven was the big time- and energy-saver here. Potatoes recommended for boiling would have been better in the pressure cooker.

FROZEN DINNER: The 11½-ounce turkey dinner was heated in its own tray. To prevent burning, the dessert was left covered in the toaster oven; it never completely baked in the microwave oven.

BEEF STEW: The recipe called for 2 3/4 pounds beef with 1½ cups liquid. The best all-around results: the pressure cookers, for time, energy and flavor.

HAMBURGER PATTIES: Four 4-ounce patties were broiled - except for those that were fried in the electric skillet or cooked in the microwave oven - to medium doneness. When fried patties were on the range tops, energy usage was considerably less than when broiling - .01 therms, gas; .18 kwh, electric.

MACARONI AND CHEESE DINNER: Times and energy usage for preparing the 7¼-ounce package didn't vary much, but macaroni prepared in the microwave oven was somewhat gummy.

FROZEN PEAS: Preparing the 10-ounce package of green peas in the toaster oven was time consuming, and it took no less energy.

YELLOW CAKE MIX: The 18½-ounce mix was divided and baked in two layers, except in the electric skillet. We poured all the batter into the skillet for a single layer, a method which consumed the least amount of electrical energy and produced a very good cake. Note the differences between the gas ovens and the electric ovens.

CHOCOLATE CHIP COOKIES: The recipe on the six-ounce package of semi-sweet chocolate pieces was followed. Having to reuse the oven tray for each batch in the toaster oven took more time, but total energy usage was less than the electric ovens.

CONSIDER OVEN MEALS FOR ENERGY EFFICIENCY

Oven meals are perfect for several reasons:

1. There's no pot-watching involved.

2. If you are having company, your meal can be timed to the split second to have everything done and ready for serving at the same time.

3. Oven meals can include everything from the meat to vegetables to bread and/or dessert.

4. Best of all, oven meals save gas or electric energy.

Prepare oven meals. Cook the entire meal at one time...main dish, vegetable, and dessert. Two or three dishes can be baked with little more energy than one. For example, if three dishes are to be cooked at similar temperatures (325°, 350°, and 375°) pick the average temperature (350°) and cook all three, making a small allowance in cooking time. The oven (which is more efficient than the range top) can be used in this manner to prepare the entire meal.

OVEN MEAL

Enchilada Pie

Frozen Green Peas

Pineapple Upside-Down Cake

375 degrees 30 minutes

ENCHILADA PIE

1 no. 2 can chili (without beans)
1 bag Fritos (2 oz. size)
1 small onion, chopped
½ lb. American cheese, grated

Place half of chili in bottom of greased 1-quart casserole. Cover with half Fritos, onion and cheese. Repeat with layers of remaining chili, Fritos, onion and top with cheese. Bake as an oven meal.

FROZEN GREEN PEAS

1 pkg. frozen green peas
½ tsp. salt
2 Tblsp. water
2 Tblsp. butter or margarine

Place peas in small casserole, add remaining ingredients, cover and cook as an oven meal.

PINEAPPLE UPSIDE-DOWN CAKE

Mix one-half box white cake mix according to directions on package.

TOPPING FOR CAKE:

1/3 cup sugar
3 Tblsp. melted butter or margarine
1 small can sliced pineapple
1 small jar maraschino cherries

Combine melted butter or margarine and sugar in well-greased 8-inch cake pan. Over this, arrange pineapple slices and cherries. Add cake batter and bake as an oven meal.

Source: Marketing and Consumer Services Department, Gulf States Utilities

Oven Meal with Tuna Casserole

Tuna Casserole
Frozen Vegetables
Hasty Cobbler

375 degrees — 30 minutes

TUNA CASSEROLE

1 can cream of mushroom soup
½ cup milk
1/8 tsp. pepper
½ tsp. dried minced onion
1 7-oz. can tuna fish (chunk style)
1 can chow mein noodles or one 25¢ pkg. potato chips, crushed

Grease a one-quart baking dish with butter or margarine. Empty soup into a bowl, then add the milk pepper and onion and stir until well blended. Empty tuna fish into a strainer, drain and slightly rinse bite-size pieces with fork. Add ½ can chow mein noodles. Pour diluted mushroom soup over tuna and noodles. Top with remaining noodles (if potato chips are used, scatter crushed chips over top of mixture). Bake uncovered with oven meal and serve piping hot to 4 or 5 people. Add a sprig of parsely, a sliver of pimento or a slice or two of stuffed olive for garnish and added flavor

FROZEN VEGETABLES

1 pkg. frozen vegetables (green peas, corn, or mixed vegetables)
2 Tbsps. butter or margarine
1/2 tsp. salt
1/8 tsp. pepper.

Place all ingredients in one-quart casserole. Cover and cook as an oven meal.

HASTY COBBLER

½ cup sugar
½ cup flour
1 tsp. baking powder
½ cup milk
2 cups drained fruit (canned or cooked apples, sliced peaches, apricots, berries)
½ cup juice from fruit or water
½ stick butter or margarine
2 tbsps. sugar

Grease 9-inch shallow baking dish (for cakes) with a tablespoon of margarine. In a small mixing bowl, combine sugar, flour and baking powder; add milk to make batter-do not overmix. Pour batter into greased dish. Add fruit and juice, then dot with butter. Sprinkle with 2 Tablespoons sugar. Bake uncovered as an oven meal. Serve warm or cold, plain or with cream.

Oven Meal with Baked Fish

Baked Fish with Creole Sauce

Frozen Vegetables — Potatoes with Cheese

(Tossed Vegetable Salad)

Apple Crumble

Temperature: 375 degrees — Time: 30 minutes

BAKED FISH WITH CREOLE SAUCE

1 pkg. frozen haddock fillets
1 Tbsp. butter or margarine
Salt
Black and red pepper to taste
1 can tomato sauce
1 Tbsp. Worchestershire sauce
1 tsp. Tabasco sauce
Lemon slices

Place frozen fish in well greased baking dish; add margarine, salt and pepper. Season tomato sauce with other ingredients listed. Pour sauce over fish. Do not cover. Bake as an oven meal. When done, garnish with lemon slices.

FROZEN VEGETABLES

1 pkg. frozen mixed vegetables
2 Tbsps. butter or margarine
½ tsp. salt
1/8 tsp. pepper

Place all ingredients in one-quart casserole. Cover and cook as an oven meal.

POTATOES WITH CHEESE

2 cans new potatoes, drained
Salt
Red and black pepper
2 Tbsps. butter or margarine
½ cup liquid from potatoes
½ cup corn flakes, crushed
½ cup cheese, grated

Place potatoes seasoned with salt, pepper and margarine in casserole dish; add liquid. Top with corn flakes, and grated cheese. Cover. Cook as an oven meal.

APPLE CRUMBLE

1 can pie apples
1/3 cup water
2 Tbsps. lemon rind
3/4 tsp. cinnamon
3 Tbsps. flour
½ cup brown sugar
1/3 cup peanut butter
¼ cup margarine

Arrange apples in baking dish. Sprinkle with water, lemon rind and cinnamon. Combine remaining ingredients and mix well. Sprinkle sugar mixture over apples. Baked uncovered on upper rack as an oven meal.

A SIMPLE SOLAR OVEN

Objective:

To demonstrate the use of direct solar energy to warm air in an enclosed space and to cook foods.

Background:

Cooking with the sun is a way to show that light energy can become useful heat energy. But time, energy, and materials must be properly invested in order to make use of "free" solar energy. This incoming energy is spread out, not concentrated. And its rays seem to change direction as our Spaceship Earth circles the sun. Still, solar energy can be used effectively for many jobs, including slow-cooking of meat and potatoes; heating houses; and heating water. This model oven will give you chances to do some solar heating and solar cooking on the next sunny day.

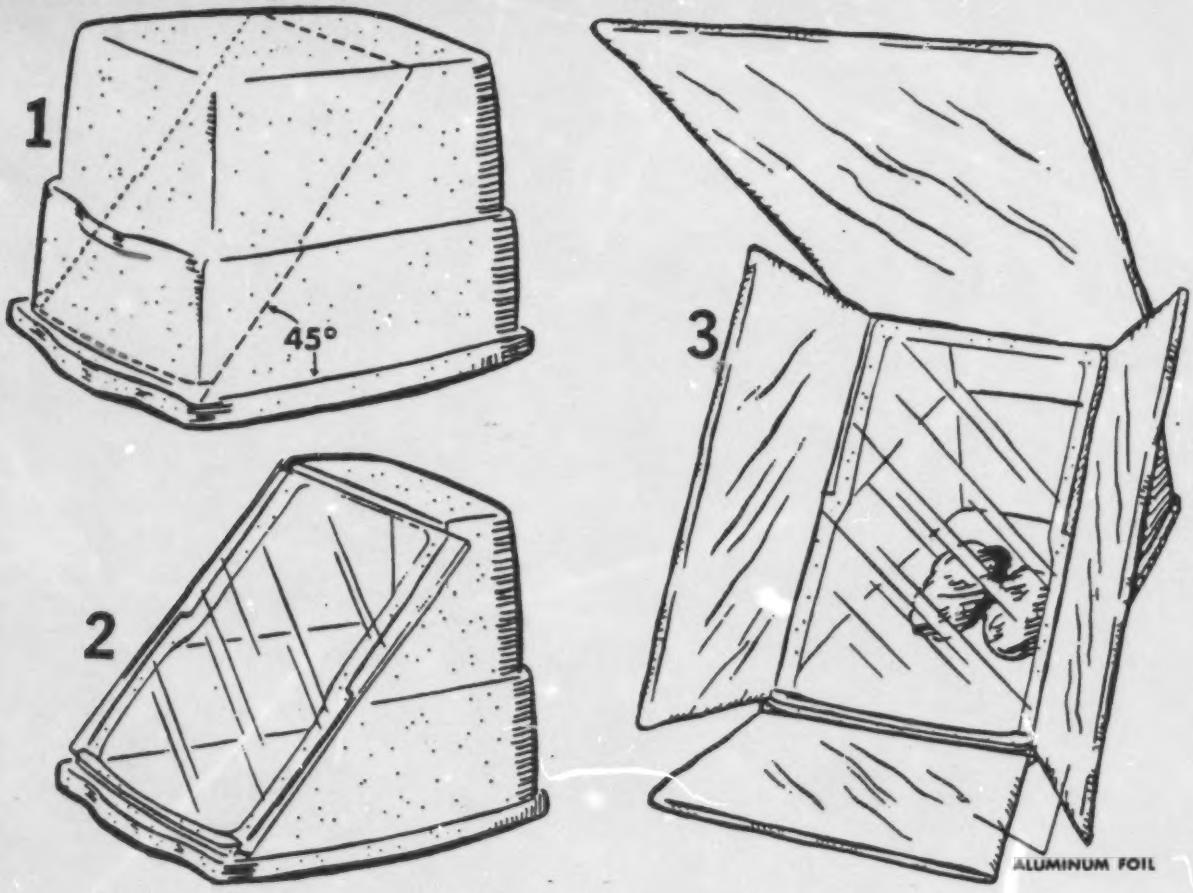
Materials:

Rectangular styrofoam cooler with tight-fitting lid
Oven thermometer
Duct tape and scissors
Jigsaw, electric knife or craft knife
Double-strength glass pre-cut to fit over your cooler opening
Asbestos sheeting
Aluminum broiler foil
Protractor, ballpoint pen
Rubber cement
Cardboard, corrugated boxes, sheet aluminum or any other reflector material available

Directions:

Set the cooler upside down on its lid. Using the protractor and ballpoint pen, mark the 45° diagonal from the bottom "lid" edge upward, as in diagram 1.

Cut as indicated by the dotted line, diagram 1, leaving slots for the glass window to rest in. Line the inside with asbestos sheeting first and then aluminum broiler foil. Cement the lining in place. You may also paint the inside foil lining with high temperature black barbecue finish paint.



Measure the opening for glass and buy a piece that will cover it and the styrofoam edges completely (diagram 2). Tape the glass securely in place and cover all edges with aluminized duct tape.

Make reflectors from cardboard or pieces or corrugated boxes covered with aluminum foil. Hinge two of them and attach with duct tape to the sides of the oven. Support the backs with hanger wire if necessary. Lay one reflector on the ground in front of the oven and angle another one over the top. (See diagram 3.) You can see spots of light on the glass when the foiled panels are positioned most effectively.

Position your solar oven outdoors with the glass directly facing the sun. You have the correct position when the shadow of the oven lies directly behind it, not more to one side than the other. Every 15-20 minutes you will have to move the oven slightly to keep it oriented to the sun.

Lift your oven off its base (formerly the lid of the cooler) to put in an oven thermometer and whatever food you want to bake slowly. Potatoes are shown in the diagram. Cookies can be baked on a cookie sheet or pie tin.

Questions:

1. What was the highest temperature recorded in your oven?

2. How could you improve efficiency of the oven?

3. Can you expect to get the same oven temperature almost any day?

4. What advantages are there to using portable solar ovens?

5. What disadvantages or limitations to the use of solar ovens have you thought about?

6. If you had only a solar oven for cooking, how would your diet change?

7. List as many consequences of widespread use of solar ovens as you can foresee.

Extensions:

Your may also want to use your "oven" (with or without reflectors) as a model of a passive solar home. Put the thermometer inside and test its heat gain outdoors on a cool day when home or school is made comfortable by use of its furnace or boiler.

Does a ground reflector help? Is the angle of the glass an advantage or disadvantage? (Change it by propping the oven higher or lower on one end.)

What effect does shading have on heat gain? (Make a cardboard "roof" extension to shelter the glass.)

Keep in mind that a house does not ordinarily move on its site (although innovative pod-like homes that turn on a pedestal have been built). Therefore storage of some of the heat gained by your "house oven" during peak suntime for release at night is important to any passive solar design.

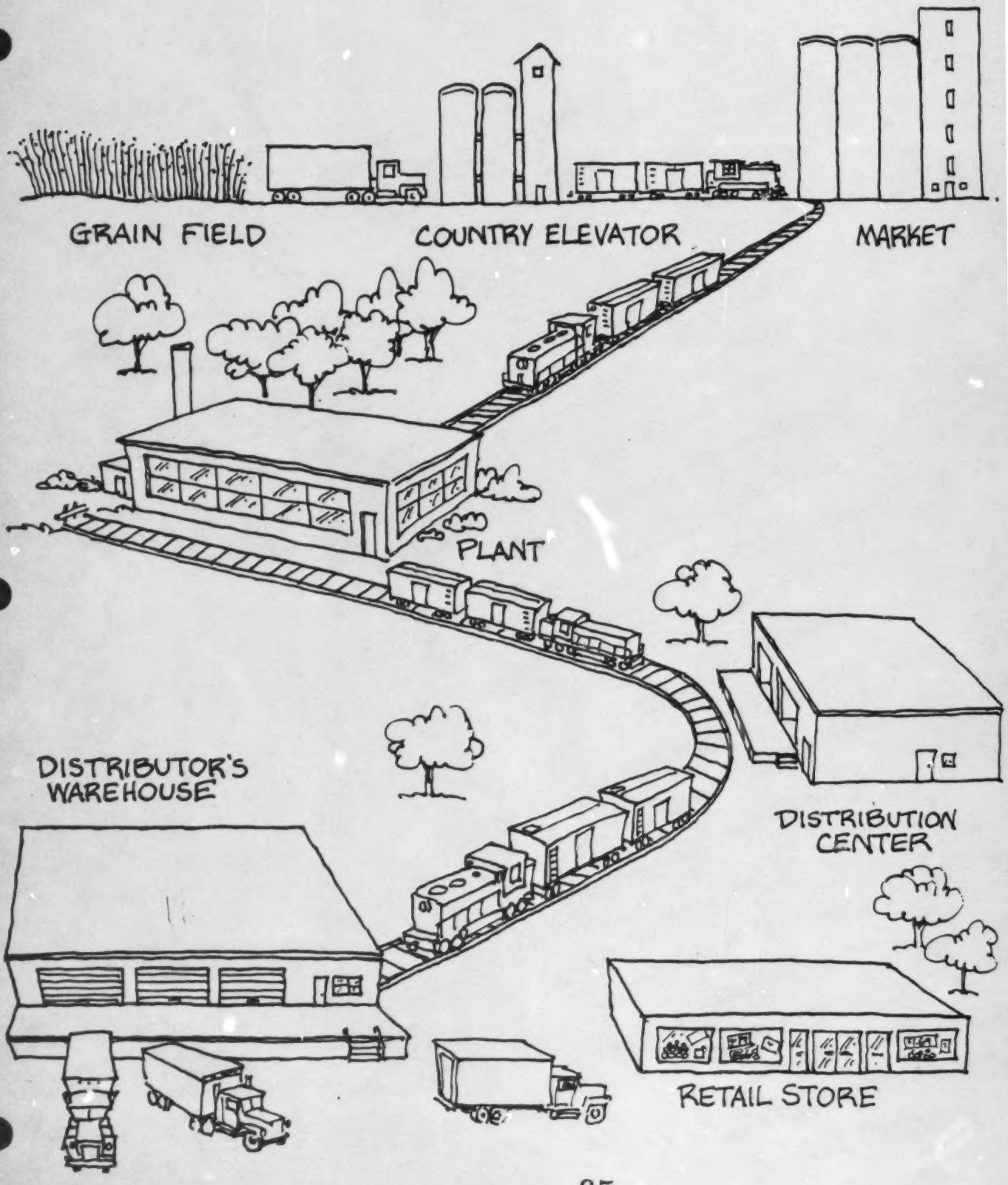
After you have recorded the temperature changes in your empty model over a period of several consecutive hours--from noon to sunset, for example--change the conditions the next day by adding one of the following: some rocks, a can of water, a can of paraffin, or a jar of eutectic salts to the interior of your construction. Record the temperature changes during the same hours as before. Compare results.

Or, if several classmates have made identical models, you may be able to test various materials simultaneously. Decide how much material each should use to keep amounts comparable. Then record temperature changes over several hours.

Which material stored heat best? Which material would be easiest to incorporate into a new house plan?

Try to find information on existing buildings using any one of the heat storage materials you tested and write a description of it to present in class.

FOOD PRODUCTION PROCESS



McReddy's Energy Menu

	Choice of One	Uses Least Energy
APPETIZER		
Frozen Orange Juice	_____	_____
Canned Orange Juice	_____	_____
Fresh Orange Slices	_____	_____
MAIN DISH		
Hot Dogs	_____	_____
Chicken (fresh)	_____	_____
Fish (frozen cod)	_____	_____
Grass-Fed Hamburger	_____	_____
Grain-Fed Hamburger	_____	_____
POTATOES		
Fresh Boiled Potatoes	_____	_____
Frozen French Fries	_____	_____
Dehydrated Hash Browns	_____	_____
BREAD		
Bakery Bread	_____	_____
Commercially Made Bread	_____	_____
Home-Baked Bread	_____	_____
DESSERT		
Fresh Apple Slices	_____	_____
Apple Crisp	_____	_____
Applesauce	_____	_____

Colorado Guide

McReddy's Energy Menu

	Choice of One	Uses Least Energy
APPETIZER		
Frozen Orange Juice	_____	3rd (Uses Most)
Canned Orange Juice	_____	2nd
Fresh Orange Slices	_____	1st (Uses Least)
MAIN DISH		
Hot Dogs	_____	4th Reasons: Amount of
Chicken (fresh)	_____	1st processing, type of feed
Fish (frozen cod)	_____	5th used for fattening, dis-
Grass-Fed Hamburger	_____	2nd tance and type of storage
Grain-Fed Hamburger	_____	3rd
POTATOES		
Fresh Boiled Potatoes	_____	1st Reason: Type of storage
Frozen French Fries	_____	3rd processing, energy used
Dehydrated Hash Browns	_____	2nd
BREAD		
Bakery Bread	_____	2nd Reason: Volume or energy
Commercially Made Bread	_____	1st used per unit produced
Home-Baked Bread	_____	3rd
DESSERT		
Fresh Apple Slices	_____	1st Reason: Amount of
Apple Crisp	_____	3rd processing,
Applesauce	_____	2nd use of oven crisp

Colorado Guide

HOW MUCH ENERGY DOES PEANUT BUTTER USE?

MATERIALS NEEDED: High energy peanut butter puzzle pictures (10 pieces)

Low energy peanut butter puzzle pictures (7 pieces)

PROCEDURE:

1. To figure out how much energy peanut butter uses, a human energy puzzle will be made. Break the group into two smaller groups. Give each person in one group a picture piece of the high energy peanut butter puzzle and each person in the other group a picture piece of the low energy puzzle. DO NOT tell the groups that one puzzle is high energy and one low energy. Figuring this out themselves is part of their challenge.

2. Explain to the group that each one of these pictures represents a piece of puzzle that when put together tells a peanut butter energy story. Their job is to work together as a group and do two things:

   a. Figure out how the puzzle pictures fit together, starting with the first step of the energy story to the last; and

   b. Figure out what peanut butter energy story is being told, or in other words, how is energy being used in each of the puzzle pictures.

3. To do this, each group will be given ten minutes for discussion. After ten minutes and the word "go" by you, each group must immediately make a human energy puzzle by physically moving into a line with the first person in line holding the first story step and the last person in line holding the last story step. Taking turns, each group should then explain their puzzle and what their energy story is. Encourage the groups to do this any way they would like. For instance, they could make up a little story for each picture with each picture representative playing the role of their picture and explaining its part. Or perhaps, they could put the story to music and make a little energy jingle with everyone singing together.

High Energy Consumption Puzzle Order (Cookies)	Low Energy Consumption Puzzle Order (Chews)
1. Planting with machinery	1. Planting by hand
2. Watering with equipment	2. Watering by hand
3. Harvesting by machine	3. Harvesting by hand
4. Take the peanuts to factory	4. Hulling by hand
5. Hulling by machine	5. Grinding by hand
6. Grinding by machine	6. Packag[illegible] by hand
7. Packaging by machine	7. Use of product
8. Take product from factory to store	
9. One goes to the store for the product	
10. The use of the product	

DISCUSSION OF THE MAIN IDEA:

1. Does one puzzle use more fossil fuel energy than the other puzzle? Which snack uses more fossil fuel energy? Yes, the peanut butter cookies use more energy.

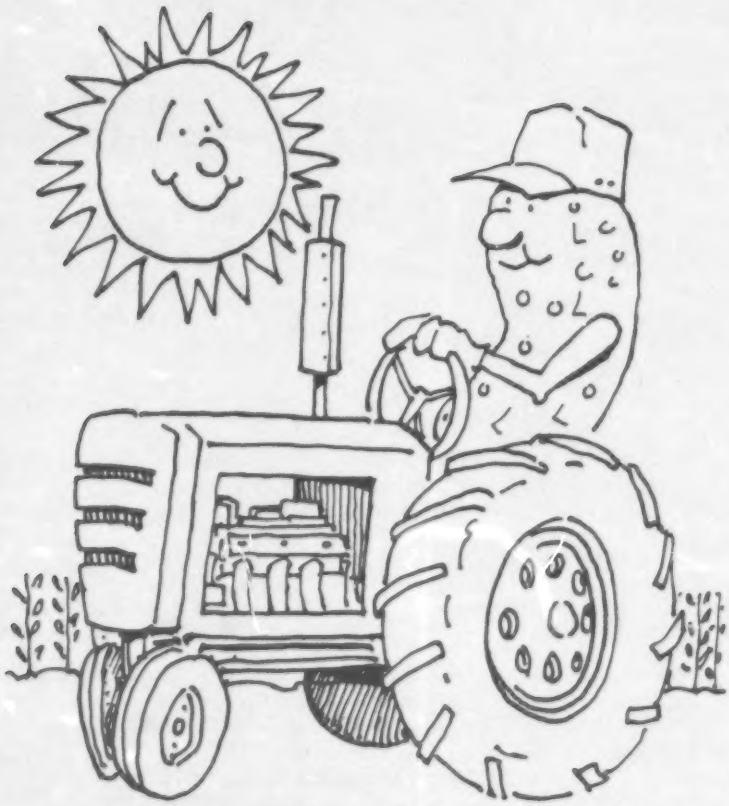
2. Why does the peanut butter cookies puzzle use more fossil fuel energy than the peanut butter chews puzzle? The peanut butter cookies were machine produced and machines use fuel; were transported to and from the factory and store and vehicles use gasoline; and were baked in the oven and the oven uses electricity or natural gas. The peanuts that went into peanut butter chews were grown in a home garden and relied on physical energy for producing and preparation. If a family couldn't grow their own peanuts, could they still make their own peanuts and make your own peanut butter?

3. Which puzzle has fewer steps? What does this mean in terms of energy consumption? The energy chews puzzle has fewer steps and steps use energy. Every step involved in making and producing a food product or anything else uses energy. The more steps involved, the more energy used.

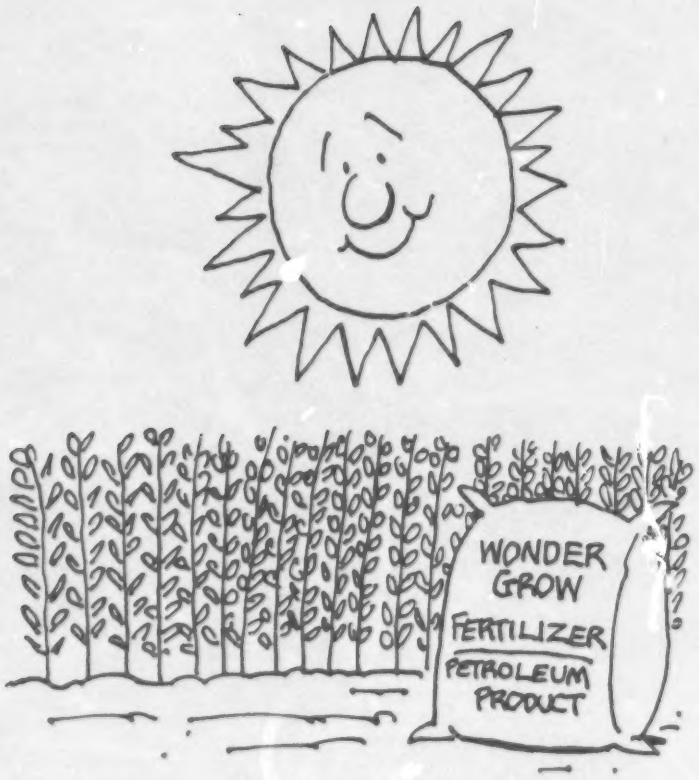
4. Do different foods use different amounts of energy? Yes.
How much energy does your favorite food use? What kind of energy does it use - fossil fuel or physical or some other kind? Is there a way it could use less energy?

5. Food uses energy, because it take energy to get energy, but is there more than one way to save energy in food or in other things that are made?

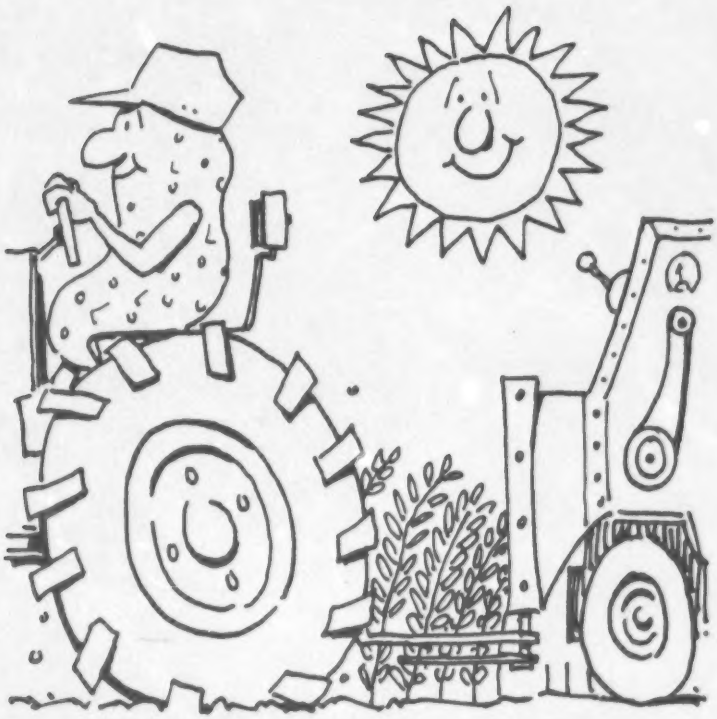
6. What other things use energy besides food?



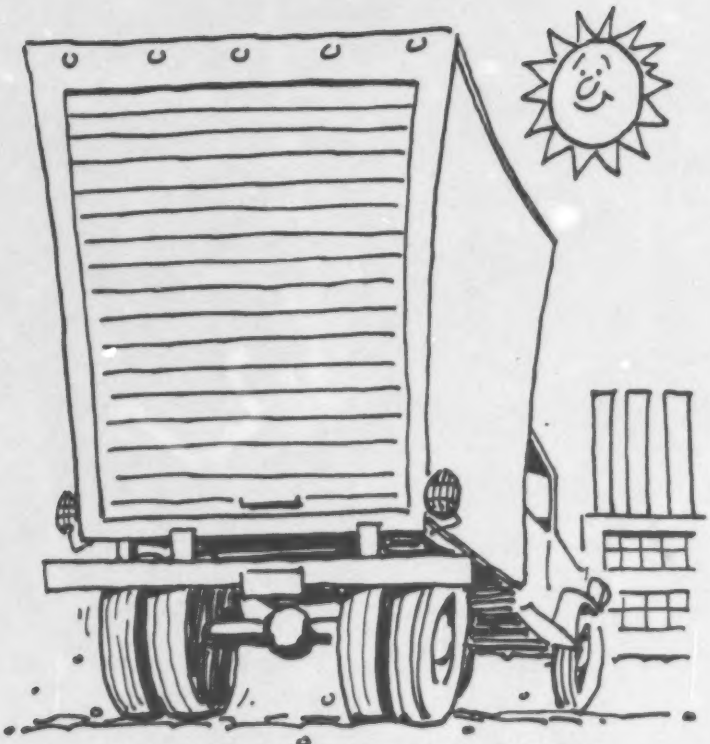
USING MACHINERY TO PLANT AND CULTIVATE (1)



WATERING AND FERTILIZING (1)



MACHINES ARE USED TO
HARVEST THE PEANUTS (1)

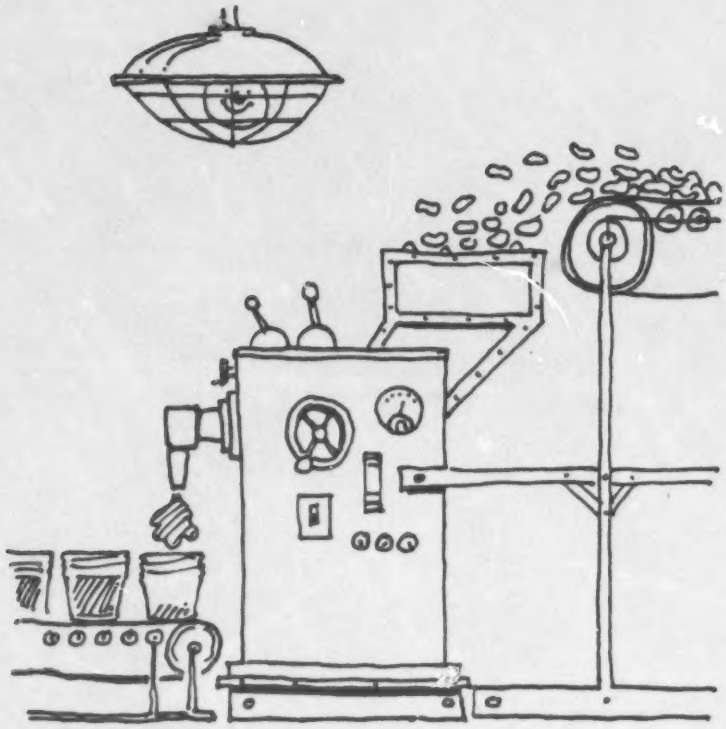


PEANUTS ARE TAKEN
TO THE FACTORY

(1)

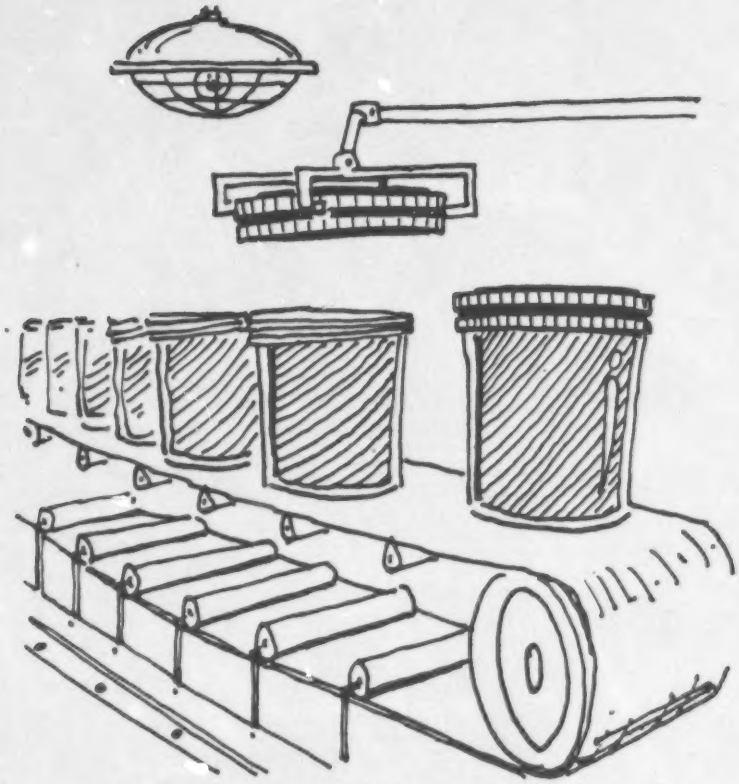
PEANUTS ARE HULLED
BY MACHINES

(1)



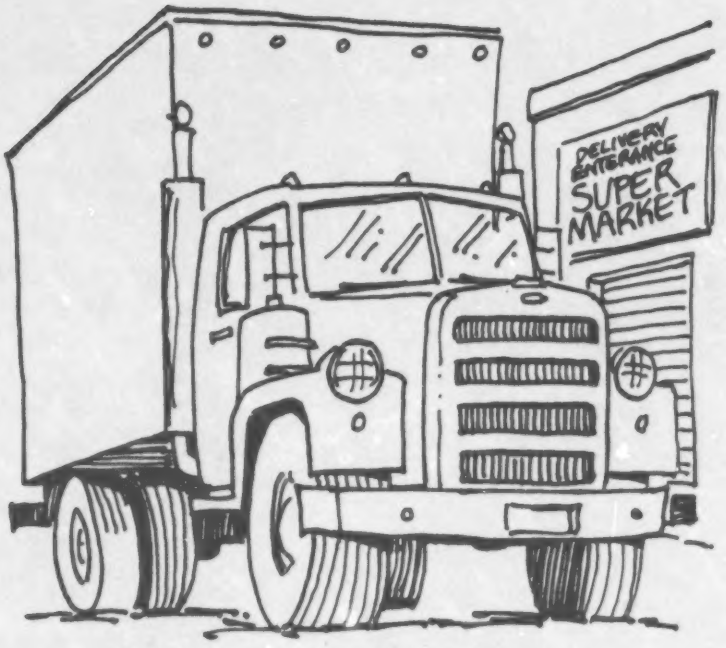
A MACHINE GRINDS
THE PEANUTS

(1)



IT TAKES ENERGY TO
PACKAGE THE PEANUT BUTTER

(1)

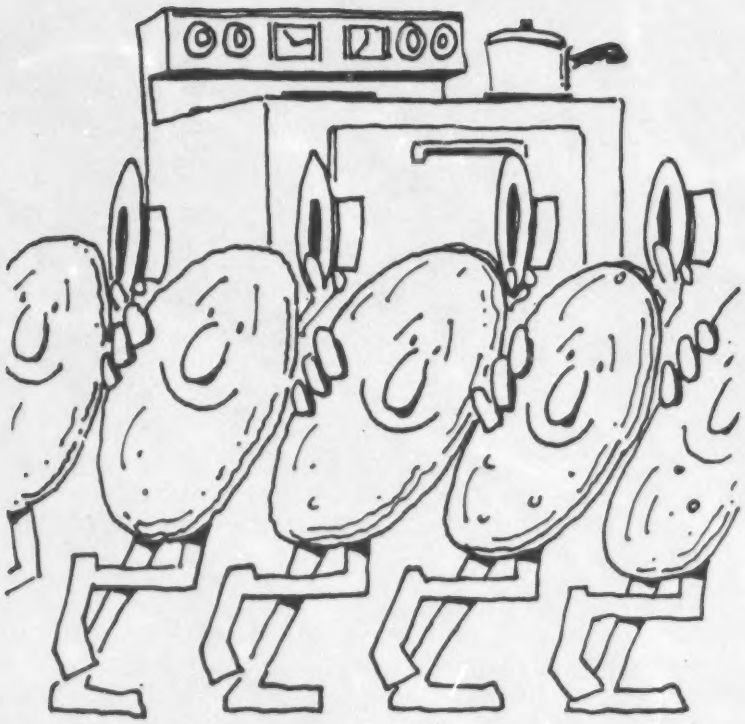


THE TRUCK BRINGS THE
PEANUT BUTTER TO THE STORE

(1)

YOU MUST GO TO THE STORE
TO GET THE PEANUT BUTTER

(1)



PEANUT BUTTER COOKIES
ARE ONE PRODUCT

(1)

PLANTING BY HAND

(2)

WATERING AND FERTILIZING
FROM THE COMPOST (2)

HARVESTING BY HAND (2)

PEANUTS HULLED BY HAND (2)

PEANUTS CAN BE
GROUND BY HAND

(2)

PEANUT BUTTER CAN BE
PACKAGED BY HAND (2)

A PEANUT BUTTER SANDWICH OR AN ENERGY CHEW IS A PRODUCT (2)

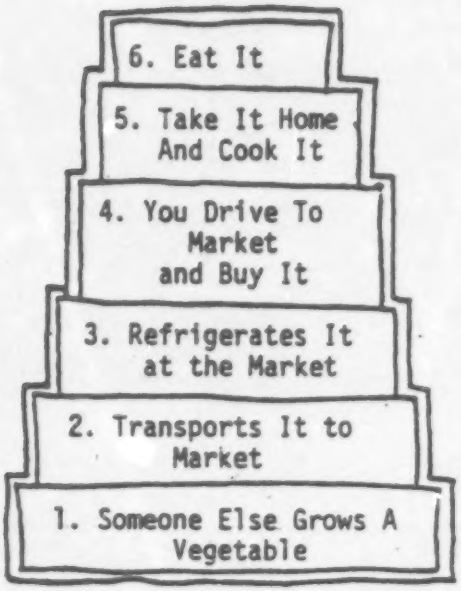
Twelve steps in a food system are listed below for a frozen vegetable.

Which steps could be eliminated to save energy?

12. Eat It
11. Throw Away Package
10. Thaw It and Cook It
9. Take Home and Put in Freezer
8. You Drive to Market to Buy It
7. Market Keeps It Frozen
6. Refrigerated Truck Takes It to Market
5. It Is Frozen
4. It is Packaged
3. It Is Sliced by Machine
2. Transports It To a Processing Plant
1. Someone Else Grows a Vegetable

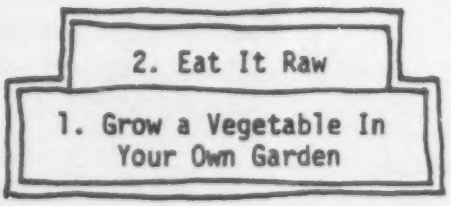
Possible Answers for Transparency

(a)


6. Eat It
5. Take It Home And Cook It
4. You Drive To Market and Buy It
3. Refrigerates It at the Market
2. Transports It to Market
1. Someone Else Grows A Vegetable

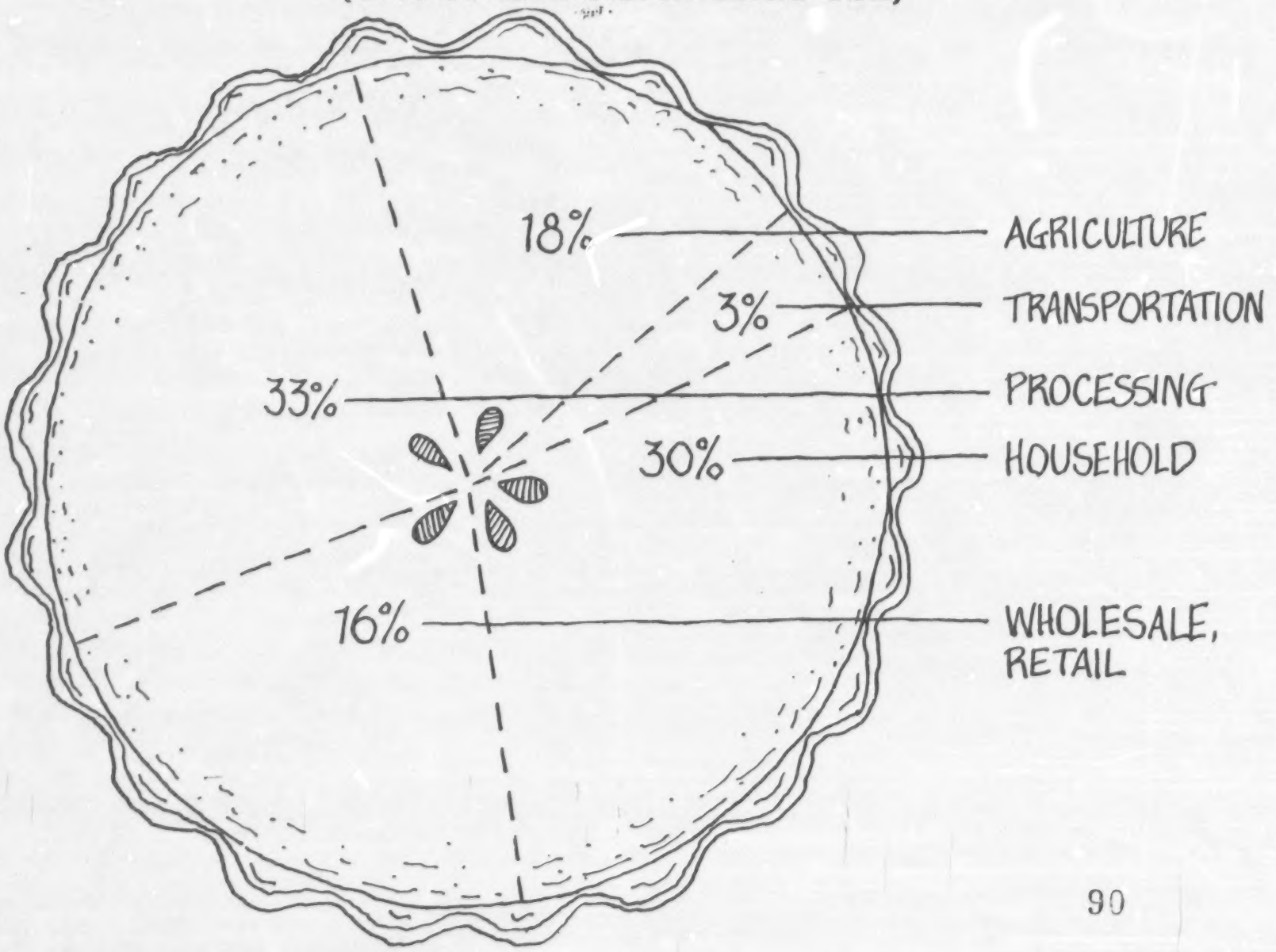
(b)

(c)



FOOD-RELATED ENERGY CONSUMPTION

(17% OF ALL U.S. ENERGY USE)



FOOD STORAGE EQUIPMENT

The storage conditions for each kind of food must be correct so that the original quality is maintained. Some foods require freezer storage, some refrigerator storage, and others dry room temperature storage. If there is any spoilage, food, money and energy are wasted

Ample space must be provided for each storage condition. Pantry storage requires little energy; however, refrigerator and freezer storage are energy-intensive. Refrigerators and food freezers run 24 hours a day. The energy required to preserve food follows third in line for home energy consumption behind (1) space cooling and heating, and (2) water heating. Refrigerators and freezers give the third greatest opportunity to conserve energy in the home. Fortunately, refrigerators and freezers are available that use as little as half the energy that others do for little extra cost. Savings in smaller utility bills can make up the difference in purchase cost in the first year or two.

The use of refrigerators and freezers greatly affects their energy consumption. Cooling appliances should be located away from heat-producing equipment and direct sunlight. The temperature control should be properly set. Turn the control to the warmest setting which will keep food properly preserved. Use a thermometer to check the temperature: 0°F for the freezer and 34°-37°F for the refrigerator are recommended. If a second refrigerator is used only during one season, unplug it for the balance of the year.

Freezers and refrigerators operate most efficiently when filled to the correct capacity. However, do not overload the refrigerator as this will keep the compressor running more than it should. Food should be place slightly apart on refrigerator shelves for correct circulation. The freezer should be kept as full as possible to prevent heavy icing. Cover all liquids stored in the refrigerator (especially frost-free models). Moisture is drawn into the air from uncoverd liquids, making the refrigerator work harder.

Finally, unless a recipe requires quick chilling or freezing, let hot food cool slightly before placing it in the refrigerator or freezer. (Caution: Food may not be safe to eat if held for more than two hours at temperatures between 60°F. and 120°F.)

Open and close the refrigerator and freezer doors only when necessary. Several items can be removed at once to reduce loss of cold air. By keeping a list of the location of foods in the freezer; the freezer door can be kept open a minimum amount of time.

Maintenance of refrigerators and freezers also affects their efficiency. The gaskets around the doors should be kept in good condition. To check the gasket, close the door on a piece of paper. If it pulls out with no drag, the seal is bad and the gasket should be replaced. (This does not apply to magnetic seals). On self-defrosting refrigerators, keep the condensate drains cleaned. On all models keep condenser coils clean for maximum efficiency and conservation of energy. The dust attachment on the vacuum cleaner can be used to clean the condenser (located at either the bottom or

rear of the unit). Dust on the condenser and coils causes the appliance to run longer. The freezer should be defrosted before frost becomes ¼ inch thick to avoid wasting energy by overworking the compressor.

Care should be taken to assure proper air circulation to refrigerator and freezer coils and compressor. As the unit's heat exchangers operate, the surrounding air is heated. Without proper circulation the air temperature around the exchanger becomes overheated and the efficiency of the unit is diminished. Under extreme conditions the compressor may "burn out." Refrigerators and freezers should not be placed in closets or small rooms with poor circulation. It is helpful to avoid placing the equipment in corners.

BASIC RULES FOR SUCCESS IN FREEZING

Freezing foods is very simple, but there are a few rules for success that must be observed. The basic ones are listed briefly here. Be sure to follow specific instructions for each food you plan to freeze.

SELECT FOODS OF HIGH QUALITY Remember that freezing retains quality, but cannot improve it.

CHOOSE BEST VARIETIES OF FRUITS AND VEGETABLES Some are better adpated to freezing than others.

FREEZE GARDEN PRODUCTS PROMPTLY Harvested vegetables rapidly lose quality at warm temperatures.

SCALD VEGETABLES Enzymic action must be retarded.

FREEZE FOODS IMMEDIATELY AFTER PACKAGING If there must be a delay, keep them refrigerated.

STORE FOODS AT 0°F OR BELOW Avoid fluctuating temperatures.

OBSERVE RECOMMENDED STORAGE PERIODS Plan a constant turnover of the freezer contents so no foods are kept too long.

AVOID REFREEZING THAWED FOODS Refreezing itself is not harmful, but the foods do suffer loss of quality. (The danger is in refreezing thawed food that has already started to spoil.)

If there are still ice crystals in the foods, they are probably in good condition and can be refrozen without risk.

HOW LONG FROZEN FOODS SHOULD BE STORED

The length of time frozen foods of high quality should be stored at 0°F depends greatly upon careful handling before freezing; type of food; good packaging materials; and proper storage temperature. Recommended storage periods, which have been determined by thorough research and experimentation, are listed in the following table.

No food should be kept longer than from one growing season to another, others should be stored for even shorter periods. For example, bacon and seasoned sausage must not be kept long because salt accelerates the development of rancidity in fat meats. It is advisable to store ground and sliced meats and cut poultry for shorter periods because they have greater exposed surface and are more readily subject to oxidation.

The longer meats are aged, the shorter time they should be kept in frozen storage. Pork requires promptness in processing, and cannot be kept in storage as long as beef. Researchers have found that the fat of turkey becomes rancid more quickly than the fat of chicken.

While freezing does not kill yeast in unbaked batter and doughs, it is weekened during long storage.

SOURCE: "Freezing Foods At Home," Marketing and Consumer Services Department, Gulf States Utilities Company.

APPENDIX C

TEACHER BACKGROUND INFORMATION

FOODS AND NUTRITION

Teacher's Guide to a Simple Solar Oven

Cooking with the sun has been one of the more popular projects attempted by solar enthusiasts. Hot dog cookers with a spit and curved reflector are easy to make. Umbrellas lined with mylar have been used to focus solar heat on a teakettle or rice pot. Curved reflectors made of aluminum also can help concentrate light onto food enclosed in black cans or glass-windowed boxes. Fresnel lenses have been used to produce intense heat, and oven plans using one are available for $.75 from Edmund Scientific Co., 1888 Edscorp Building, Barrington, NJ 08007.

A durable oven made of sheet aluminum and plywood is described in detail, with construction diagrams, in Practical Sun Power by Rankins & Wilson, from Lorien House (publisher), P. O. Box 1112, Black Mountain, NC 28711, for approximately $4. This model would be appropriate for industrial arts students to build and would last longer than the model described here. However, it would require a greater initial investment of time and materials to complete it.

The styrofoam box model suggested here is inexpensive to construct and can be used as a "model house" as well as a solar oven (with minor modifications). Turning the "lid" into a "base" eliminates some cutting and fitting. Most materials are readily available and can be worked without special tools. To prevent out-gassing of the styrofoam into the oven, it is important to cover the styrofoam with asbestos sheeting (comes in 24" wide rolls at the hardware store and is very inexpensive--$.25 worth should line an oven this size). This, in turn, is covered with aluminum foil. Less critical is the decision whether or not to paint the interior black. If you do, use a black finish made to withstand heat. There was no noticeable difference in temperatures recorded between bright foil-lined and painted-foil-lined models that this author built. Differences between single and double panes of glass were also small. Double-strength glass is recommended, however, as it is less likely to crack under heat. When the oven was empty (full of air, as in a house) then a double-paned glass model heated 10-15°F hotter than a single-paned one. When water was to be heated (as in a rice casserole, or potatoes or meat which are three-fourths water themselves), the single-paned model cooked faster.

Simple flat aluminum foil reflectors, on the other hand, improved performance considerably, raising the interior temperature of a double-glazed model by 40°F in 15 minutes on a September afternoon. Mirrors or curved aluminum reflectors may improve performance even more.

The main problem with the reflectors as described is wind. Unless reflectors are weighty, every breeze can change their position and reduce their effectiveness. Wind chills the oven, too, suggesting the need for careful sealing and more insultion if the oven is to be used often.

One of the main objections to solar cooking in fuel-short Third World countries is that the ovens work best around noon. This is not the traditional time for a cooked meal. Daylight hours are for working,

marketing, schooling and any other away-from-home acitivites. Evening is the time for socializing over dinner, but sunlight is not available then. . . . solar ovens also need adjustment (about every 20 minute at our latitude) or turning to keep the glass front in direct line with the incoming sunlight.

The low heat (280°-300°) developed in the model oven described is suitable for baking potatoes (2-3 hours, depending on size) or slow-roasting meat or heating casserole dishes. Cookie dough would be a good choice for an edible project that can be baked during class time.

SOURCE: Iowa Developed Energy Activity Sampler, Iowa Energy Policy Council

GLOSSARY

GLOSSARY

Active solar system - a space or hot water heating system that depends on energy-consuming equipment (pumps, blowers, electric controls, automatic tracking devices, etc.,) to collect or to move the solar heat.

Air conditioning - the process of treating air to control its temperature, humidity, cleanliness, and distribution within a particular space.

Air conditioning filter - material usually made of fiberglass or foam rubber used to collect dust, dirt, grease and other particles and to prevent them from entering mechanical heating and cooling equipment.

Air Exchanges - uncontrolled movement of a volume of air in or out of a room or an entire building over a period of time. Air exchanges (AE) are sometimes expressed as whole-volume exchanges per hour or, alternatively, as cubic feet per minute (CFM). A standard, insulated new home is expected to have 1 AE/hour; a specially constructed, energy-efficient house may have only 1/2 AE/hour. Drafty, uninsulated houses typically have 2 - 4 AE/hour.

Air pollution - a level of concentration of foreign materials in the air that unfavorably affects the life and health of air breathing plants and animals (especially humankind) and/or affects property adversely.

Appliance - any device meant for a specific use, but especially those requiring commercial power input for operation. Common household appliances include refrigerators, stoves, toasters, dishwashers, mixers, irons, washers and dryers, television, and stereo sets.

Atomic energy - energy obtained from disturbances within the nucleus of the atom. The resulting disintegration of matter into energy may be spontaneous (as in natural radioactivity) or it may be induced artificially (as in nuclear fission for production of electricity and in uncontrolled fusion for the firepower of hydrogen bombs).

Attic ventilation - system used to remove heat and moisture from the attic. Example: wind turbines and eave vents without ventilation, heat build up may become excessive. At night, heat may continue to radiate into the rooms or space below. Ventilation is also required to remove damaging moisture from the attic.

Types include:

1. Wind turbines
2. Continuous ridge and soffit vents
3. Gables
4. Power vents

Barrel - a liquid volume equal to 42 gallons of 159 liters. One barrel of crude oil has about the same heat energy as 350 pounds of bituminous coal.

Blackout - a shutoff of all electrical power in a given area. It can be caused by storm damage, equipment failure, or overloaded circuits because of unusually heavy consumer use.

Brownout - the deliberate reduction of power to users of electric utilities whenever demand for power exceeds generating capacity. During a brownout, lights will dim and fans run more slowly. Some appliances stop running altogether.

B.T.U. (British Thermal Unit) - the amount of heat energy required to raise the temperature of one pound of water one degree Fahrenheit. One BTU is approximately equal to the amount of heat given off by a wooden match. A pound of coal contains approximately 13,000 BTU of chemical energy.

Calorie - the amount of heat required to raise the temperature of one ml of water one degree Celsius; a metric unit of heat energy.

Capacity - the maximum load for which a generator, transmission circuit, power plant, or system is designed.

Caulking - a soft, semi-solid material that can be squeezed into non-movable joints and cracks of a building, thereby reducing the flow of air in and out of the building.

Coal - solid fuel formed by the decomposition of plants buried deep under Earth's surface. A whole group of naturally occurring, carbon and hydrogen-rich rocks are called "coal". Various types are ranked by the percentage of carbon in dried samples or by the calorie value of moist ones. Age and depth of burial contributed to differencial changes in the original plant debris. The concentration of carbon increased over time (hundreds of millions of years) as trapped moisture and gases eventually escaped and pressure forced changes in the organic remainder.

The chemical composition of coal varies widely. It is not homogeneous and regional differences, reflecting both variations in its history of formation and the kinds of plants involved, are common. However, gross distinctions can be made. From least to most carbon-rich, the coal group includes peat, lignite, sub-bituminous and bituminous coals, and anthracite.

Comfort zone - the ranges of indoor temperatures, humidity, and air movement under which most people enjoy a feeling of well-being.

Condensation - the change in state from a gas to a liquid, releasing energy.

Conduction - the flow of heat from a warm material to a cooler one in direct contact with it; the transmission of energy directly from molecule to molecule.

Conservation - making the best use of natural resources by reducing waste, improving efficiency, and slowing the rate of consumption.

Convection - transfer of heat energy by the movement of currents of a liquid or a gas.

Curtailment - cutting back the use of energy resources as opposed to conserving or wisely using resources.

Damper - a device used to vary or stop the volume of air passing through an air inlet, outlet, or duct, such as a fireplace.

Deciduous trees - trees which lose their leaves in the winter. They allow the sun in during the winter but keep the sun out during the summer.

Degree-day - the difference between 65° and the daily temperature. For example, if the low temperature for Friday was 12°F and the high for the day was 28°F, the number of degree-days for the day was

$$(65°F - \frac{28 + 12°F}{2}) = (65°F - 20°F) = 45$$

The greater the number of degree-days in a particular area, the higher the energy consumption for heating and cooling is likely to be.

Ductwork - if your home has central cooling and/or heating, it will have ductwork. Ductwork is the air delivery system to the rooms. It is most commonly found in the attic or in the furred down (low) areas of the ceiling.

E.E.R. (energy efficiency ratio) - rating used to help the consumer determine and compare the operating costs of heating and cooling equipment. E.E.R. indicates how completely an electrical appliance converts energy at the point of use. The rating is derived by comparing heating or cooling power (output) to energy consumed (input). The higher the rating, the more energy-efficient the equipment (Example E.E.R. of 9.0 would cost less to operate than E.E.R. of 6.5).

$$\frac{\text{BTU per hour (cooling capacity)}}{\text{watts (electrical consumption)}}$$

Efficiency - the ratio of useful work or energy output to total work or energy input. One hundred percent energy efficiency is impossible. There is always a cost or "handling charge" in any energy conversion. In addition, some forms of concentrated energy and some energy-consuming systems provide much more energy than is needed to do a particular task. For example, using a 350 horsepower car to transport one healthy person two miles to a swimming pool or gym for exercise is a highly inefficient use of both the driver and the car. A bicycle would be more efficient according to the standard pioneered by the American Physical Society: "thermodynamic efficiency is the ratio of the least available work that could perform the task to the available work actually consumed in doing the job with a given device or system."

Electric meter - device that measures electricity in kilowatt-hours and has either dials or numbers for recording the amount used.

Energy - the ability to produce motion against resistance (work); or, whatever heats, lights, moves, or changes matter.

Energy audit - the examination of a building's construction and materials, mechanical and electrical systems, energy usage patterns, in order to identify possibilities for energy conservation.

Evaporation - the change from liquid to gas which requires extraordinary absorption of heat by the material undergoing this phase change. Liquid water, for example, absorbs 540 extra calories per gram at 100°C as it vaporizes. This heat will be released again if the water vapor condenses.

Evergreen trees - trees that keep foliage all winter. Coniferous trees are evergreens which make especially good windbreaks.

Fiberglass - a material made of extremely fine filaments of glass which are used in masses as insulation.

Flourescent lamp - a lighting device in which light is produced by the passage of electricity through a metallic gas enclosed in a tube. Flourescent bulbs provide about four times as much illumination per watt as incandescent ones do; they give off about 75% less heat; they cost more initially but they last approximately seven times longer than incandescents; and they include types that can be used in existing incandescent fixtures.

Foot candles - the unit of direct illumination at a given location, equivalent to the energy of light received on a surface at a distance of one foot from a standard candle. It is equal to one lumen per square foot.

Forced air - a common type of heating system in which air heated in a furnace is then blower-driven or "forced" through ducts to all areas of the building. The primary fuel may be coal, fuel oil, natural gas, or wood, but electricity is also needed to power the blower and thermostat.

Fossil fuel - any naturally occurring underground fuel formed by decomposition and/or metamorphosis of the remains of ancient life forms. Coal, crude oil, and natural gas are fossil fuels.

Fuel - any substance used to provide heat energy.

Gasket - rubber, plastic, or metal band used around the door frames of appliances and cars to form a tight seal, reducing energy losses by infiltration.

Geothermal energy - heat trapped in the interior of the Earth is called geothermal energy. Boreholes into the crust show an average temperature increase of 1°C for every 30 meters depth, or about 100°F per mile. Geothermal heat is believed to come from the decay of radioactive materials deep in the Earth as well as some from friction of rock movements, tidal forces, and perhaps other sources. This heat keeps great quantities of buried rock molten and hot. Some of this energy escapes at the surface as hot water. Geothermal energy is available in four forms; dry steam, wet steam, hot rocks, and geopressured hot water.

Greenhouse effect - the warming effect of carbon dioxide and water in the atmosphere acting as a "lid" to slow the escape of heat from the Earth's surface. Molecules of water and carbon dioxide absorb and reradiate back to Earth much of the heat radiated from it.

Heat gain - the amount of heat provided to an enclosed space from all sources, including people, lights, appliances, sunshine, and furnace; a figure used to estimate the size and performance of heating and air conditioning system.

Heat loss - a decrease in the amount of heat contained within an enclosed space, resulting from heat flow through walls, windows, roof, and other building components.

Heat pump - a device that transfers heat from a cooler region to a warmer one (or vice versa) by the expenditure of mechanical or electrical energy. The heat pump operates by alternately evaporating and condensing a refrigerant, or heat transferring fluid, in a closed cycle. It differs from a typical refrigeration unit in that the heat pump can reverse its cycle to provide heat instead of removing it. Heat pumps are both heaters and air-conditioners and, compared to electric resistance elements often used in all-electric homes, they are more efficient.

Hydroelectric plant - an electric power plant in which the turbine-generators are driven by falling water.

Incandescent light - a common lighting device containing a solid filament that glows when electric current is passed through it. The filament's resistance to the current makes it glow with heat. The output of an ordinary incandescent bulb is about 95% heat.

Infiltration - the natural process by which air leaks into or out of a building, especially through cracks around doors, windows, vents, electrical outlets, and any other small openings or breaks in the exterior surface. Wind, significant temperature differences between the interior and exterior, lack of caulking and weatherstripping, numerous windows and vents, and inadequate insulation all contribute to high rates of infiltration.

Insulation - material used in home construction to retard (slow down) the heat loss from a home in the winter and heat gain in summer. Some commonly used materials are fiberglass, cellulose, mineral or rock wool, and styrofoam.

Intermediate peak period - 10 a.m. to 2 p.m. and 6 p.m. to 10 p.m. in GSU service area. A period of moderate use of electricity.

KWH - (kilowatt-hour) - the amount of energy equal to 1000 watts of electricity used for one hour. (Example: Ten 100-watt light bulbs burning for one hour.)

Life cycle cost - the total cost of an article over its entire useful life, including operating, maintenance, and financing expenses in addition to the purchase price.

Megawatt - a unit of power equal to 1,000 kilowatts or 1,000,000 watts. It is usually used to describe the capacity of power plants.

Natural gas - mixture of gaseous hydrocarbons occurring naturally in certain rocks. There are several kinds of gas trapped in porous rocks underground. One of these "natural gases" is methane, used as a commercial fuel. Petroleum deposits always include some methane, but natural gas deposits are not always accompanied by petroleum. Natural gas is commonly sold to individuals in hundreds of cubic feet (Ccf), the unit appearing on household utility bills. One Ccf of commercial methane has about 25,000 Calories, the equivalent of 8 pounds of coal of 0.7 gallons of crude oil.

Natural gas meter - device that has dials like the electric meter, but measures gas consumption in hundreds of cubic feet.

Non-renewable resources - energy resources that are not being replaced during human history. Examples are coal, oil, natural gas, and uranium.

Nuclear power plant - a generating station that converts nuclear energy into some form of useful power, such as mechanical or electrical power. In a nuclear power plant, heat produced by a reactor is generally used to make steam to drive a turbine that, in turn, drives an electric generator.

Nuclear reaction - a change in an atomic nucleus due to fission, fusion, neutron capture, or radioactive decay, as distinguished from a chemical reaction which is limited to changes in electron structure surrounding the nucleus.

Off-peak period - when demand for electricity is the least. 10 p.m. to 10 a.m. on weekdays and all weekend in GSU service area. (On weekends, industries do not need as much electricity and businesses are closed.)

Overhang - a solid horizontal projection on the exterior of a building placed (ideally) so that it shades southern windows in summer only. An overhang may be fixed or movable, part of the original construction or a retrofit. Several designs are possible. An upward-tilted overhang can also serve as a reflector in winter.

Passive solar system - Building design, materials, and equipment that together deliver 50 times more heat to the interior of a building than does the non-renewable supplementary energy it uses. Passive systems rely on natural energy flows, collection, and storage with a minimum of mechanical aids and a minimal use of fossil fuels.

Payback period - the amount of time it takes for an energy-saving improvement to pay for itself through savings on the utility bill. If adding R-30 insulation to a home with R-0 insulation costs $500 and you save $250 a year on your utility bill, it would pay for itself in 2 years.

$$\frac{\$500 \text{ (cost for insulation)}}{\$250 \text{ (yearly savings)}}$$

Peak period - Time of day when the greatest demand for electricity occurs (2 - 6 p.m., Monday through Friday).

Petroleum - a naturally occurring, oily, dark-colored liquid mixture of hydrocarbons. Refineries distill this raw material into gasoline, kerosene, diesel fuel, lubricating oil, waxes, and other products.

R-Value - the resistance to heat flow. The higher the R-value, the greater the insulating efficiency of the material. Thickness is a factor also, so R-values are commonly stated per inch of building material. R-values are additive--thicker material or a combination of materials means increased resistance to heat flow. Some typical R-values per inch of material are 6.25 for polyurethane foam; 3.17 for fiberglass batts; 1.25 for fir and pine wood; 0.18 for plaster; and 0.08 for concrete.

Radiation - emission and propagation of energy through space; pure energy that travels rapidly until striking materials that can absorb it. Then absorbed radiation will either induce a chemical change (as in photosynthesis, sun tanning, photography, photovoltaic cells) or increase the random motion of the molecules of the material contributing to its temperature. Examples of bodies emitting radiation are the sun, electric lights, human beings, waters and cements that are warmer than their surroundings, Franklin stoves, and radioactive materials.

Reclamation - Process of replacing the soil, clay, and rocks removed earlier to expose coal or oil shale for strip mining; compacting and leveling the site; and replanting it to restore its appearance and reduce erosion and drainage of waste materials.

Renewable resources - materials that are recycled by natural proccesses within a relatively brief span of time (a human lifetime). Fresh water, wind, sunshine, and trees are some examples of resources that seem to renew themselves within human time frames.

Retrofit - add energy-saving features to an existing home.

Site orientation - the relationship of a home's or building's position to prevailing winds, sun, vegetation, and other buildings, which can affect the heat loss or heat gain performance of the home or building. Example: locating a home so that most of the windows are facing north and south in order to minimize heat gain in the summer.

Solar cell - a thin sheet of semi-metallic material (usually silicon) which can convert energy from the Sun directly into electricity. An individual cell on the retail market in 1980 typically produces a small potential difference of about 0.5 volts and about 0.6 watts of power. An array of solar cells can provide a useful electrical capacity.

Solar collector - a device which collects the Sun's energy as heat. They are made in many shapes and styles: flat-plate, tubular, and concentrating. Air or liquids are the fluid media usually used for heat transfer.

Solar energy - electromagnetic radiation emitted by the nearest star, the Sun. Earth receives about 4.2 quadrillion kilowatt-hours of energy per day from the Sun.

Storm window - a glass or plastic covering for a conventional window, used to provide additional protection from cold and wind. A well-sealed storm window traps an insulating layer of air between itself and the other window, decreasig heat loss due to conduction through the glass and keeping the inside pane warmer.

Strip-mining - a method of mining coal that lies less than 110 feet below the surface. Overburden (soil, clay, and rock, above the fuel) is scraped away by huge mechanical shovels and stored, layer by layer, in separate piles. The coal is removed and then (ideally) layers of overburden are replaced in their former relative positions, topsoil uppermost.

Thermostat - a temperature-sensitive device which turns heating and cooling equipment on and off at set temperatures.

Ton of air conditioning - the thermal refrigeration energy required to melt one ton of ice (2,000 pounds). As a means of expressing cooling capacity, 1 ton = 12,000 BTU/hour cooling.

Vapor barrier - a material used to prevent moisture from passing through warm interior walls of a building and condensing on the cold exterior walls, thus soaking insulation and causing other problems. Plastic sheeting is often sealed against wall studs as a vapor barrier; special backing on batt and blanket insulation, foil or plastic wall coverings and special interior paints are other vapor barriers used to keep humidity inside a building.

Watt - a measure of electrical power. Wattage is a product of the voltage (measure of the "pressure" in an electrical circuit) and the amperes (current or flow of electricity). One volt and one amp applied to a circuit for one hour would use one watt-hour of electricity.

Weather stripping - foam, metal, felt, or rubber strips used to form a seal around windows, doors, vents, and other movable openings where infiltration can occur.

Wind break - a dense row of trees, or a fence or other barrier that interrupts and changes the local path of the wind.